IN TWO SECTIONS—SECTION ONE

THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL, 1938

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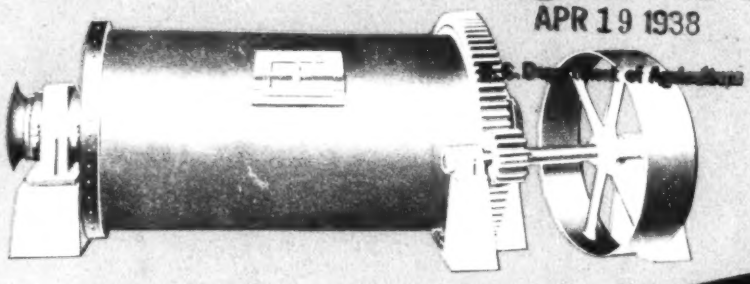
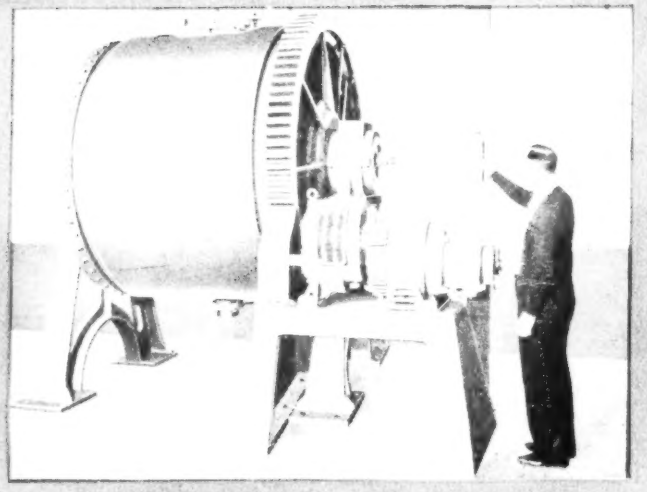


Patterson Tube Mill — Belt Driven — a continuous feed and discharge machine for grinding standard coatings, lime sludge, china clay, etc., etc. Fitted for use as Rod Mill — this unit is efficient for pulping.

PATTERSON MILLS



Patterson Pebble Mill — Motor Driven — the most efficient BATCH machine made for grinding paper coatings, lime sludge, china clay, etc., etc.

SATISFACTION PATTERSON MACHINERY

Patterson Mills are the accepted standard in the grinding rooms of the Paper Industry. They save labor and power and time ... they often eliminate other machinery. Invariably they deliver a uniformly fine smooth product at the very minimum cost.

Richard L. Cawood Jr.

THE PATTERSON FOUNDRY and MACHINE COMPANY

EAST LIVERPOOL, OHIO, U. S. A.

STANDARD OIL COMPANY'S

STANOCYL

STEAM CYLINDER OIL

cures cylinder scoring at this plant

THE superintendent of a central state industrial power plant was having difficulty with his Corliss engine. It simply would not pull its rated load. An inspection disclosed that the cylinder was dry and scored.

The following excerpt from his letter describes how StanoCyl and Standard Lubrication Engineering Service came to the rescue.

"We were advised by a business acquaintance to call the Standard Oil Company, which we did at once. As a result, your engineer came to our plant and made a complete inspection of the entire unit and made some minor repairs of damages that had been caused by the previous use of improper lubricants. He also gave us the brand name of products sold by your Company that would be suitable for the engine demands. These products were StanoCyl W and Polar 200 Oil.

"A stock of each product was ordered and placed in service. Our troubles have been completely disposed of. The engine pulls our full load without a tremor.

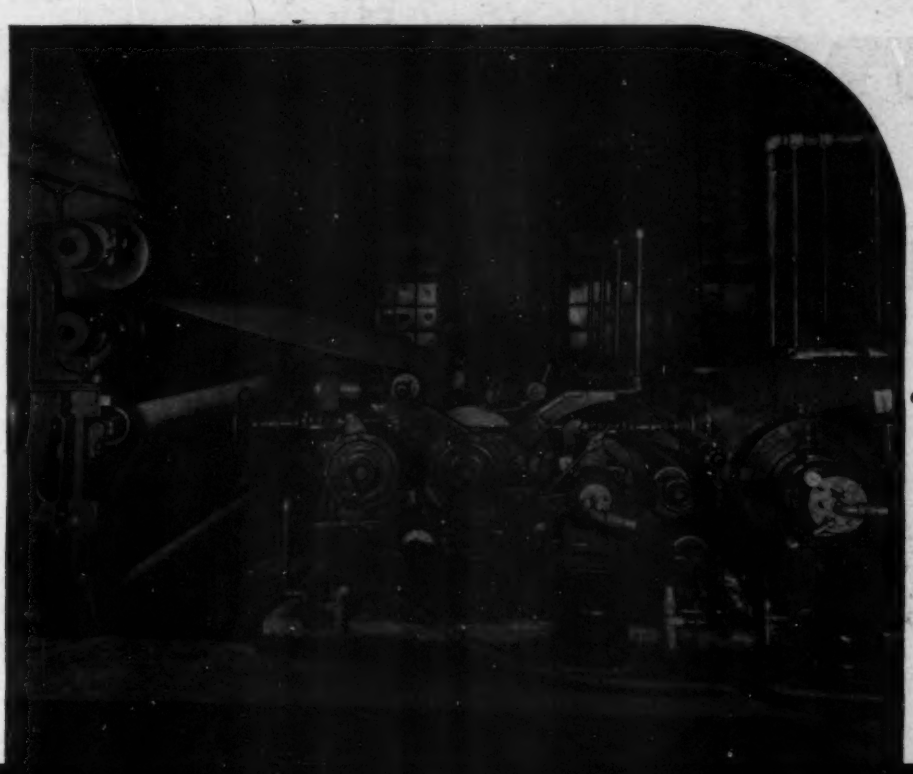
"We can, without any hesitation, recommend this product to steam engine owners who are having difficulties with cylinder lubrication."

There are three grades of StanoCyl to meet all operating conditions. A Standard Lubrication Engineer will gladly recommend the grade you need. Call him at your local Standard Oil (Indiana) office or write 910 South Michigan Avenue, Chicago, Illinois.

Copr. 1938, Standard Oil Co.

STANDARD OIL COMPANY (INDIANA)

THE RIGHT LUBRICANT • PROPERLY APPLIED • TO RE...



BELOIT HORIZONTAL *Dual Press*

PATENTS PENDING

—A MAJOR STEP FORWARD

IMPROVED QUALITY OF PAPER

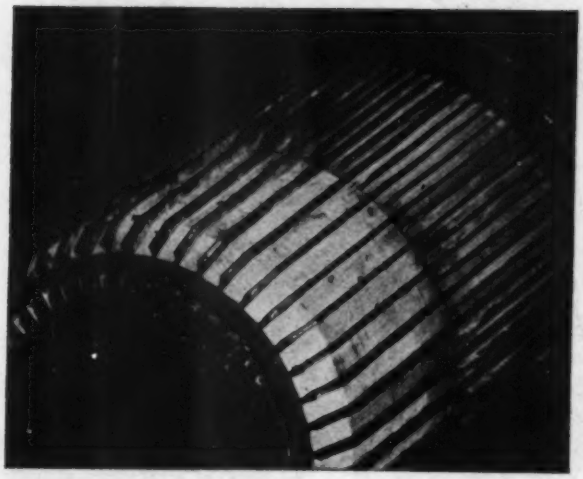
INCREASED PRODUCTION

GREAT SAVING IN FELTS

THE BELOIT WAY BELOIT IRON WORKS PAPER MACH'Y BELOIT WIS. **IS THE MODERN WAY**

BELOIT IRON WORKS BELOIT WISCONSIN

RUST
TAKES A HOLIDAY



Jordan bars of ARMCO Stainless Steel help preserve paper stock color and cleanliness. The bars are highly resistant to corrosion and abrasion and give much longer service.

Rust is practically a stranger in mills that use equipment made of ARMCO Stainless Steels. Pulp and paper come through clean and maintenance costs are less.

Short metal life and paper stock damage caused by corrosion are things of the past. Chemicals used in pulp and paper production have little effect on ARMCO Stainless Steel. It is highly resistant to abrasion and assures longer equipment life. The quality of your product improves and you save money in the bargain.

Let ARMCO Stainless help you produce good paper. It is ideal for the cheaper grades of paper as well as the finer grades. There is a correct type for every application. We'll help you select and apply it—or just specify "ARMCO Stainless Steel" to your equipment fabricator. The American Rolling Mill Co., 1321 Curtis St., Middletown, Ohio.

ARMCO

ARMCO
STAINLESS STEELS

THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL

Devoted to the Interests of the Pulp and Paper Industry

APRIL, 1938
Vol. 20—No. 1

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For better groundwood pulp at lower cost, rely on this precise, automatic Temperature Control System ...

YOU get bigger production when grinding temperatures are exactly controlled. You get greater tensile strength in the stock, too. By avoiding temperature fluctuations, you avoid fluctuations in stock freeness and color. And there's far less danger of the grinding stone's surface blistering and shelling.

Here's what automatic control of grinding temperature by Taylor has done in different mills, according to actual records. What would these results mean in *your* mill?

2.4% more groundwood pulp a year ... 6.1% decrease in power consumption per ton ... 66% less variation in freeness... practically no stone breakage ... one-sixth less burring.

Taylor Control Systems are adaptable to all grinders—pocket, semi-magazine, caterpillar and hydraulic magazine. They are accurate, dependable and rugged. They soon pay for themselves by increasing production and decreasing production costs.

Let Taylor engineers give you full information about close, automatic regulation of grinding temperatures. Let them also tell you about other Taylor Systems for recording liquid level in the digester, for indicating calender roll pressure and for recording beater roll pressure. These are trouble-savers and money-makers also.

To take advantage of the advice and assistance of Taylor engineers, offered without charge, see a Taylor representative. Or write Taylor Instrument Companies, Rochester, N.Y. Plant also in Toronto, Canada. Manufacturers in Great Britain—Short & Mason, Ltd., London, Eng.

FOR ALMOST FOUR YEARS Taylor Control has precisely regulated temperatures for these caterpillar type grinders. Indicated by white circle is a Taylor Fulscope Recording Controller, brains of Taylor Control Systems. These systems control temperatures for pocket, semi-magazine and hydraulic magazine grinders as well as for the caterpillar type.

Taylor

Indicating Recording • Controlling

TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS

WHAT LIQUID? WHAT QUANTITY? WHAT HEAD?

Just give us the answers to those three simple questions, and we will soon have in your hands our recommendations as to just what type and size of Buffalo Pump will render *you* the most efficient and economical performance.

The thousands of satisfied customers who have purchased their pumps from Buffalo in this manner during the past 60 years provide ample proof that it is the Right Way to buy pumps. Why not try it the next time *you* need pumps?

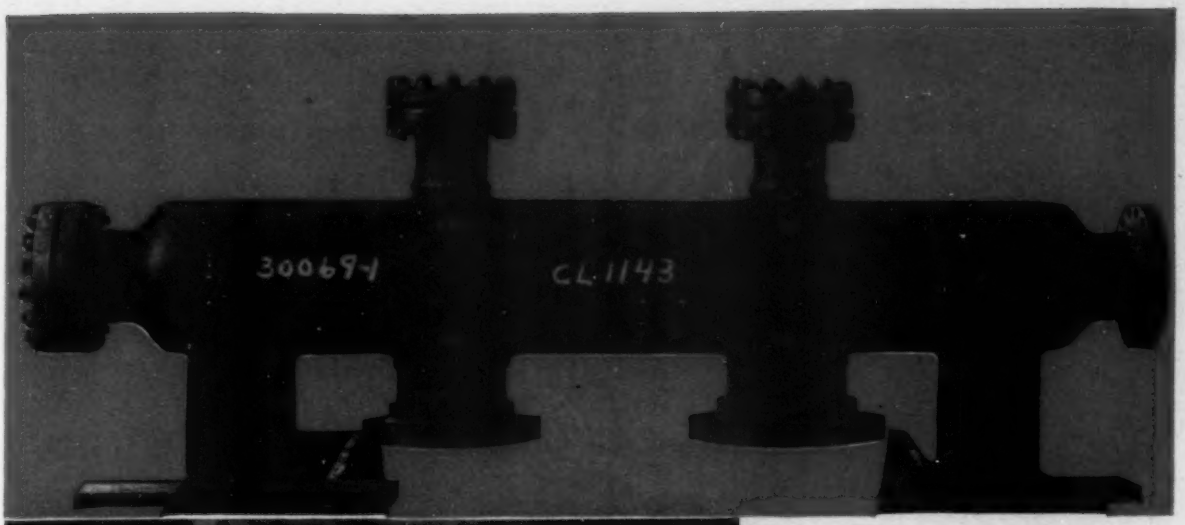
BUFFALO PUMPS, INC.

213 Mortimer St. Buffalo, N. Y.

Branch Engineering Offices in Principal Cities **In Canada: Canada Pumps, Ltd., Kitchener, Ont.**

"Buffalo" PUMPS

used where Performance Counts



THREE-DIMENSIONAL BENDS
Another example of complicated power installation made simple by Grinnell Prefabrication. Note the smooth contours, the compound bends, accurate to a degree.

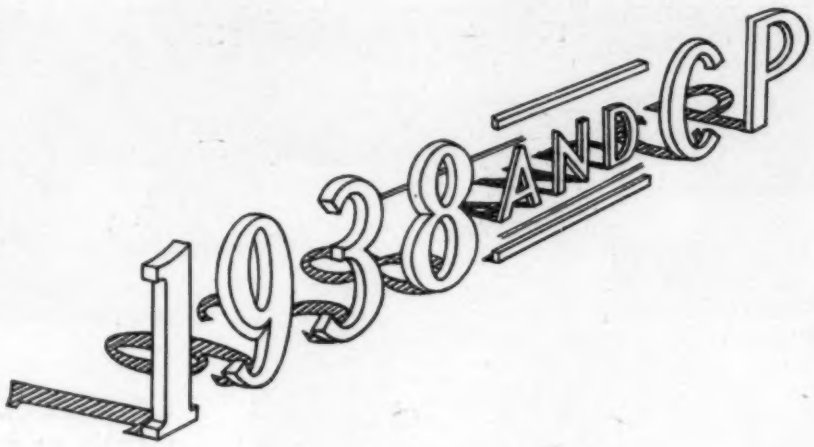
GRINNELL INTERPRETS PLANS INTO *Strength!*

Each specification of this 18" Header has been carried to exacting accuracy—the result of the interpretative engineering that is an important feature of Prefabrication by Grinnell. The outlets extruded by hydraulic machines permit each weld to be a plain circumferential butt weld.

The ability to interpret into piping the ideas and plans of engineers is one of the Grinnell "extras" by which your power and processing installations achieve strength and endurance. Thorough pretesting, delivery on schedule, ready qualification for insurance, plus many other requirements, are answered automatically when engineers say, "Give the plans to Grinnell." Send for interesting picture-story of Grinnell Prefabrication. Grinnell Company, Inc., Executive Offices, Providence, R. I., Branch offices in principal cities of the U. S. and Canada.

PREFABRICATION BY **GRINNELL**

WHENEVER PIPING IS INVOLVED



As everyone knows CP stands for "Chemically Pure". It also stands for Chemipulp Process. We do not mean to imply that the pulp produced by the Chemipulp Process is chemically pure, but the substantial improvement in the quality of the pulp produced by the Chemipulp Process is worthy of serious consideration and investigation at this time.

CHEMIPULP PROCESS INC.

500 WOOLWORTH BUILDING
WATERTOWN, N. Y.

3311 FIRST AVENUE SOUTH
SEATTLE, WASH.

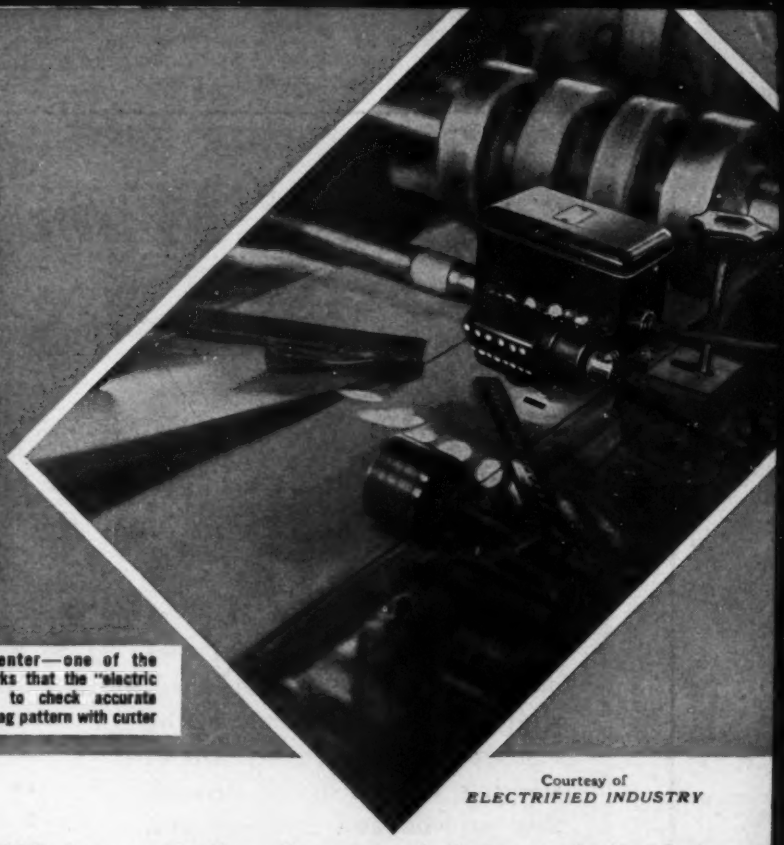
Associated with CHEMIPULP PROCESS LTD., Montreal, Quebec

To

MILL EXECUTIVES SEEKING NEW PRECISION METHODS

Now

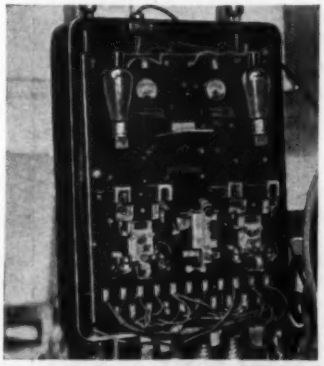
AUTOMATIC CUTOFF IS CONTROLLED BY G-E PHOTOELECTRIC RELAYS



At right center—one of the register marks that the "electric eye" scans to check accurate register of bag pattern with cutter

Courtesy of *ELECTRIFIED INDUSTRY*

Cut bag-forms ready for sealing, showing position-register marker



G-E photoelectric control panel (cover removed) for compensator driving cutting knives on Smith & Winchester tuber. These pictures are by courtesy of the Hammond Bag & Paper Co., Wellsburg, W. Va.

WORKING in co-operation, the paper industry and electrical manufacturers have "put the electron tube in overalls" in various effective ways.

One of these applications is that of paper-register control that is automatic and precise. For example: in one plant, tubes of paper that are to be made into bags are cut at exactly the right point by a machine controlled by G-E photoelectric relays. The cutting is kept within register by photoelectric scanning of a register mark for each bag pattern. The scanning mechanism governs a relay that retards or advances the cutting to compensate for any stretching or shrinking of the web of paper.

In this way the cutoff is automatically exact, this feature making possible *faster* output and well-nigh eliminating spoilage at this point in the processing.

When you require precision control of processes in which a light beam can be interrupted to actuate the control, investigate the application of G-E photoelectric relays. Because applications of the "electric eye" involve precision arrangement, requiring careful engineering and manufacturing, these applications have been limited to large-scale processes or to processes where ordinary methods have not been successful. For information on the photoelectric paper-register control, inquire of the nearest G-E sales office or write General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

Those "*Worn-out*" Press Rolls!

Even with new jackets, bronze or iron press rolls will quickly develop etched and pitted surfaces which pull the fibres and open the texture of the paper.

CRODON plate on metal press rolls or carrying rolls supplies *and maintains* a smooth, hard, slippery surface, of noteworthy assistance in the prevention of sticking, uneven drying, inaccurate crowns and frequent roll adjustment.

This imparts to the paper a smooth, *consistently uniform* finish . . . . the delays and expense of grinding and eventual replacement of rolls are eliminated.

New:

Our plants have developed new and improved methods of recovering worn, porous or corroded rolls. Blemishes and imperfections are abolished . . . . the desired *perfect* surface, well bonded to the base metal, is obtained . . . . *enduring* new-roll performance at low cost is assured.

CRODON
The Chrome Plate

Fix those rolls *now*, and fix them *RIGHT*

Our service is available immediately. Rolls are out of service for only a short time before they are again ready for use, restored to new-roll condition and insured by CRODON for long and satisfactory service.

The trade-mark CRODON assures the best in chromium plate

Your own investigation of CRODON should be decidedly worth while, judging from the experience of many representative companies whose substantial cost-reductions and trouble-free operations are consistently attained with the aid of CRODON plate.

Chromium Corporation of America

Executive Offices—120 Broadway, New York

P. O. Box 1546
Waterbury, Conn.

3125 Perkins Ave.
Cleveland, Ohio

4645 West Chicago Ave.
Chicago, Ill.

"Harvesters At Rest" by Jules Alexis Muenier—Courtesy Pennsylvania Museum of Art, Philadelphia

"Tomorrow's Harvests will be of Today's Plantings"

THE PUSEY AND JONES CORPORATION, WILMINGTON, DELAWARE

In Dryer Felts One Mill's Meat May Be Another Mill's Poison!

The old adage says that "One man's meat may be another man's poison"—and it is just as true that one paper mill's success with a given dryer felt may be another mill's dismal failure. In other words, as every experienced mill man knows, there is a wide variation in the operating conditions that affect dryer felt performance—and, for this reason, no one dryer felt or type of dryer felt can possibly serve as a "cure-all" for every drying problem.

Because this fact has long been recognized by Hooperwood engineers, the HOOPERWOOD line includes not only both general types of dryer felts—cotton and asbestos—but, also, several variations of each type. Altogether, there are seven regular HOOPERWOOD Dryer Felts—four of cotton and three of asbestos construction—and each one was designed to meet a particular operating requirement with maximum efficiency and economy.

If your present dryer felts are costing too much per ton of production, we will welcome an opportunity to discuss the problem with you and to help you choose the particular Hooperwood felt which will best meet your own operating conditions.

WM. E. HOOPER & SONS COMPANY

General Offices: Juniper and Cherry Sts., Philadelphia · 320 Broadway, New York City · 300 W. Adams St., Chicago, Ill.

Selling Agents: GENE BECHARD, Atlanta, Ga. · HARRY W. STRATTON, Portsmouth, N.H. · M. E. AVERY CO., Watertown, N.Y. · DANE CHARLES, Seattle, Wash.

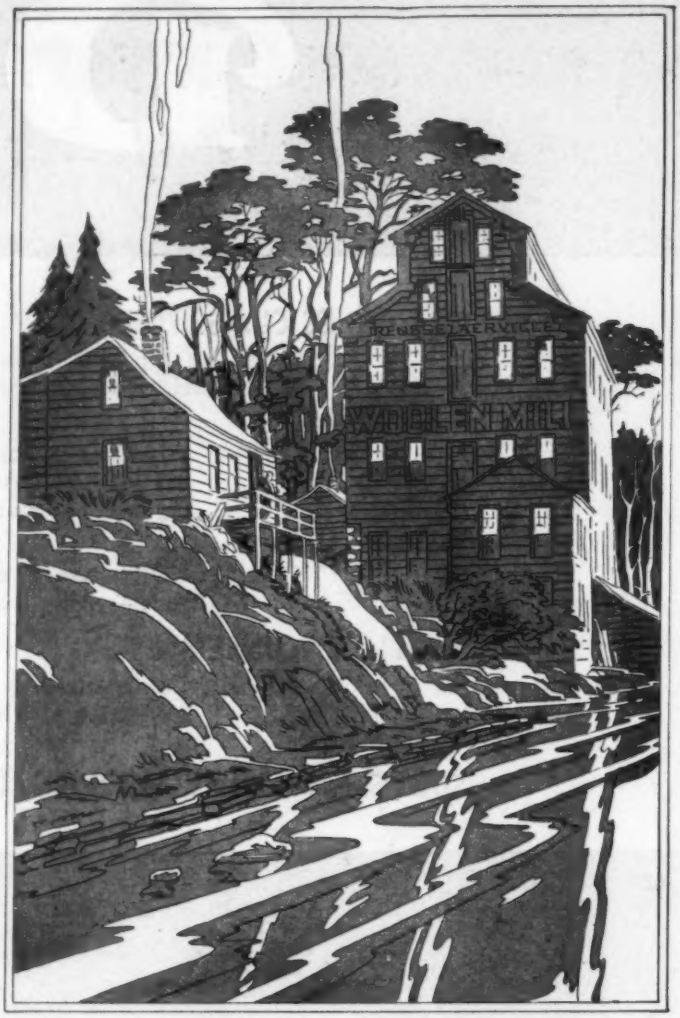
HOOPERWOOD ASBESTOS AND COTTON DRYER FELTS

Dilts

- **COWLES CLASSIFINER:**
  Dilts built to defiber and clarify waste paper stock efficiently at a high rate of production.
- **EFFICIENCY:**
  A greater capacity than is usually required means no overloading—lower operating expense while producing a refined stock of better quality.
- **QUALITY:**
  Uniformly high quality stock eliminating foreign material—giving a stock with stronger and longer fibres.
- **ABLE ENGINEERING:**
  Consultations on your individual requirements without obligation. Write for details.

DILTS MACHINE WORKS, Inc. **FULTON, N. Y.**

IT STARTED BY A WATERFALL



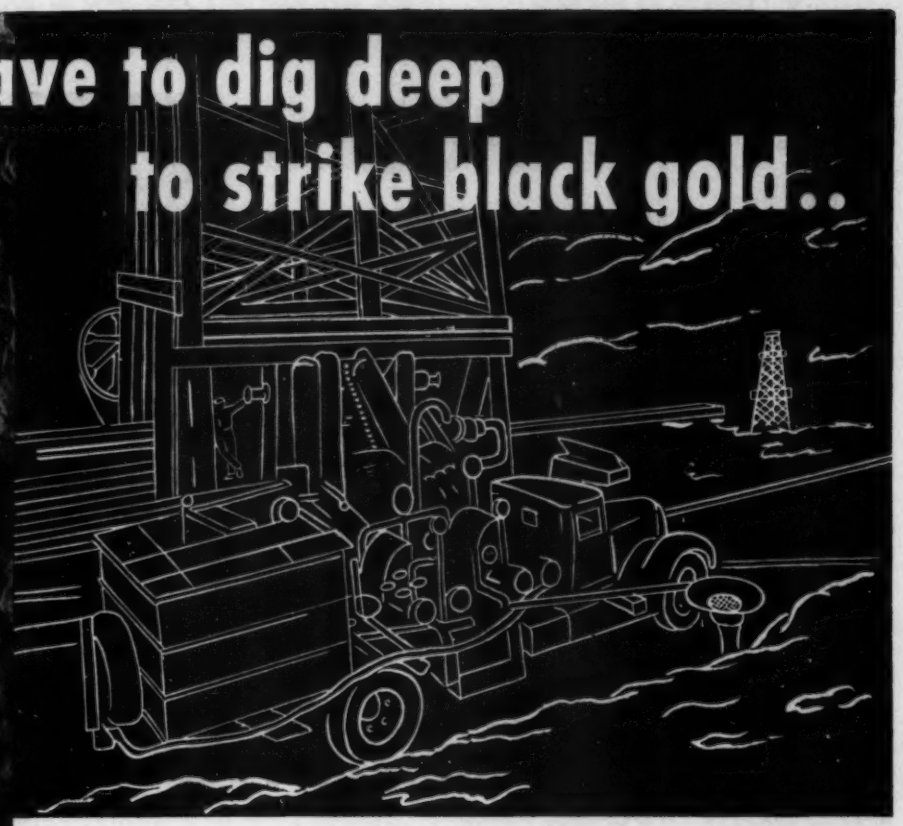
Shortly after the Civil War the development of the process of making paper from wood pulp lent a great impetus to the American paper industry. Up to that time, practically all papermakers' felts were imported from England. In 1870 a young man in Rensselaerville, New York, decided that America should be able to manufacture its own felts. In a little woolen mill that had already been in operation for 100 years, situated by a waterfall in that little country town, Francis Conkling Huyck first experimented with making papermakers' felts and founded the company that now bears his name. The American paper industry, then in its infancy, has made remarkable progress since those early days and today is recognized as the leader throughout the world. The best indication of how F. C. Huyck & Sons have kept pace with the progress of this industry is the fact that in America more Kenwood felts are used than any other make . . . that in all parts of the world Kenwood felts are used extensively, even in England.

KENWOOD
WOOL PRODUCTS

KENWOOD FELTS

F. C. Huyck & Sons · Albany, N. Y.

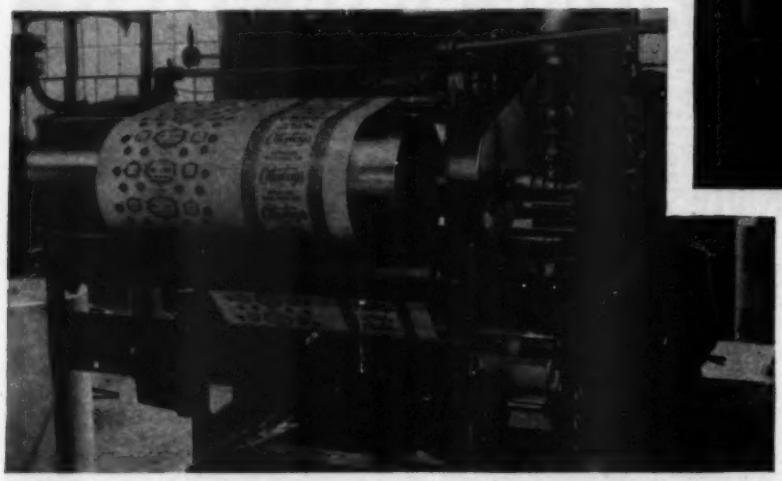
You have to dig deep to strike black gold..



Oil or important paper making machinery improvements... you get neither by merely scratching the surface. Instead, you've got to hit rock bottom fundamentals before your research can lead to anything new and outstanding. ● Black-Clawson-Shartle know this... they practice it... and, important for you, have results to show for it. For example, take Tugboat Annie and the several amazing new Fourdrinier features recently announced. ● The organization that is always forging ahead through research is the organization to solve your problems. Black-Clawson and Shartle Brothers . . . builders of tomorrow's paper mill machinery.

BLACK-CLAWSON and SHARTLE BROS.

Keep **RUST** *and* **CORROSION** *off the face of your* **ROLLS**



MONEL-COVERED DRYER ROLLS
36" diameter by 68" face

Roll marks and rust stains caused much complaint with these cast iron dryers handling white and fancy colored zinc chloride treated fibre products. Applying $\frac{1}{8}$" Monel sheet cover solved this problem completely. Monel covers give no trouble due to heat expansion, which is almost the same for cast iron, steel and Monel.

(Left) **MONEL-COVERED CHILLING ROLL**
15$\frac{3}{16}$" diameter by 50$\frac{1}{2}$" face

The covering of this steel wax paper chilling roll with $\frac{1}{16}$" thick Monel sheet eliminated all trouble experienced previously due to the rusting and pitting of the steel surface. The smooth and clean Monel cover insured production of an unblemished waxed paper, and improved the efficiency of the roll, making possible a one-third increase in the speed of the machine.

...by having them **MONEL COVERED**

Wear and corrosion-resistant coverings applied to paper machine rolls offer other advantages, too . . . .

ADD to your old rolls even longer life than they had when new. Get rolls covered with Monel* and you give them a hard, smooth surface that repels accumulation of pitch, and prevents sticking of fuzz or paper sheets.

By means of a patented welding process the Youngstown Welding and Engineering Co. now applies a Monel sheet covering to cast iron, steel, brass, bronze and aluminum rolls of 5 inches to 15 feet or more in diameter. Firmly and permanently anchored to the roll, the Monel sheet presents a ground and polished surface that is immune to rust, and stoutly resistant to wear and paper mill corrosives.

What is the performance of Monel-covered rolls? The captioned photographs show a few examples: Trouble and lost time eliminated, products improved, and in addition, production increased.

MONEL-COVERED WET FELT TUBE ROLLS — 15" diameter by 240" face

This press section is one of five Pusey & Jones wide, high speed machines in Southern Kraft mills which are equipped with $\frac{1}{8}$" Monel-covered steel tube wet felt rolls, including the worm rolls. The Monel covers on these rolls afford full protection against corrosion and their smooth, clean surfaces do their part to cut down friction on the felts.

Instead of discarding old rolls, have them covered with Monel. The box below shows the wide variety now in use. And remember, your own or new rolls covered with Monel can be obtained through any of the prominent paper machine builders. Write for Bulletin C-3, "Monel in Pulp & Paper Mills"; "Monel-Covered Rolls on Pusey & Jones Machines"; "Covered Rolls—a new development for industrial protection", and "Monel-Nickel-Inconel† Covered Rolls". Address:

Monel-covered rolls are now serving in paper mills as:

Press rolls	Table rolls
Smoothing press rolls	Wire return rolls
Dryer rolls	Wire stretch rolls
Sweater rolls	Wire shaking rolls
Waxed paper chilling rolls	Wet felt rolls
Dance rolls	Sized paper guide rolls

† Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.

* Monel is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.

. . . on paper made with Krebs Pigments

EVERYONE is interested in pictures — editors and advertisers are using illustrations more and more. This trend is a challenge to the paper industry.

Of course, modern printing technique makes the best of the cheaper grades of paper, but any illustration is improved if printed on paper made with opaque white pigments. This modern paper mill practice prevents "show-through" and provides a brilliant white background against which no detail is lost. The type, too, is easier to read.

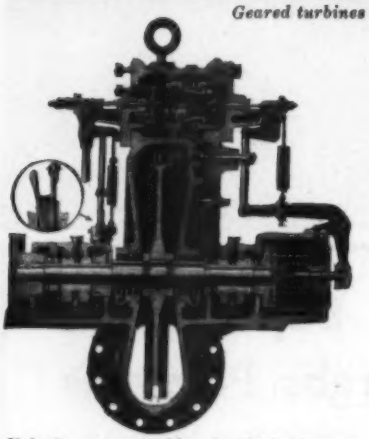
You can depend on Krebs white pigments to make any paper whiter, brighter, and more opaque.

KREBS

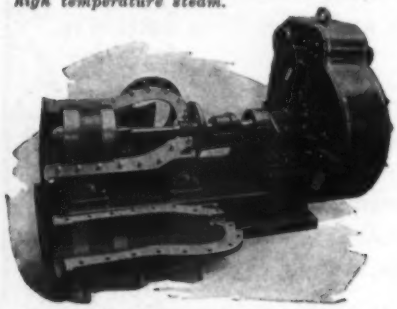
PIGMENTS FOR PAPER

KREBS PIGMENT & COLOR CORP. . . . . 1007 ORANGE STREET, WILMINGTON, DELAWARE

Geared turbines for driving induced draft fans, designed to use steam at 475 lb. gage.



Velocity stage turbine for high pressure, high temperature steam.



Steam turbine driven propeller circulating pump.

WHERE there is some use for the exhaust steam, both plant efficiency and reliability can be greatly improved by installing steam driven auxiliaries.

For many purposes, such as driving high pressure centrifugal pumps, centrifugal blowers, propeller pumps, De Laval-IMO oil pumps, and small generators, the steam turbine and the driven machine can be directly coupled.

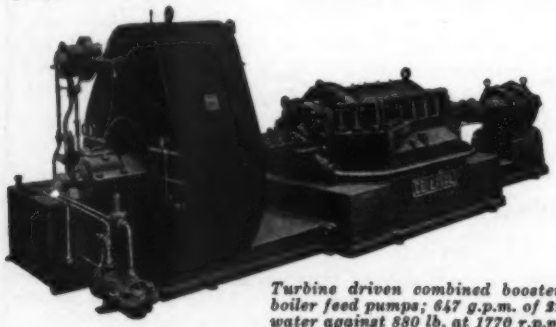
With slow and moderate speed machinery, such as low head pumps and fans, DC generators, conveyors, pulverizers, etc., high efficiency and other desirable operating characteristics for both turbine and driven machine can be realized by transforming the speed by means of De Laval Helical Gears or De Laval Worm Gears.

Every De Laval unit is designed to work together as a whole, and is assembled, tested and guaranteed by a single and reliable organization, responsible for all parts of the unit and for their proper coordination.

Advice and data relating to steam turbine drives will be supplied by us upon receipt of a statement of your conditions.

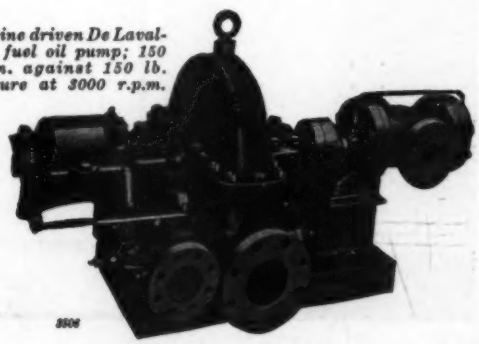
DE LAVAL STEAM TURBINE CO.

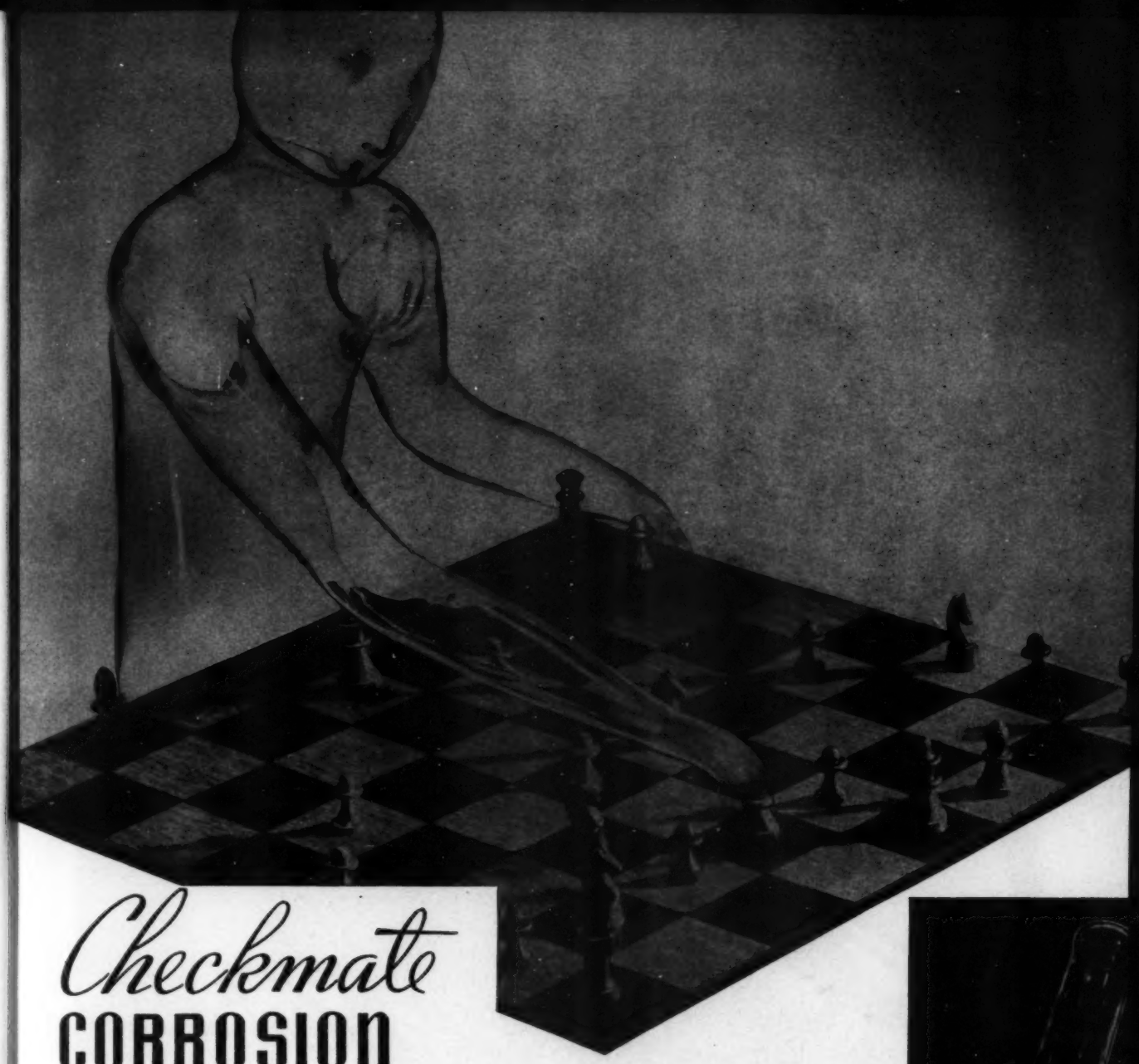
TRENTON, NEW JERSEY



Turbine driven combined booster and boiler feed pumps; 647 g.p.m. of 275° F. water against 880 lb. at 1770 r.p.m. The turbine receives steam at 600 lb. per sq. in. and 850° F.

Turbine driven De Laval-IMO fuel oil pump; 150 g.p.m. against 150 lb. pressure at 3000 r.p.m.





Checkmate CORROSION

Pipe line corrosion is checkmated when "PYREX" Piping enters the game. The remarkable resistance of "PYREX" Brand Glass to acids and alkalies in solution (except concentrated HF) rids your pipe line of corrosion problems. In the paper manufacturing business that's good news—it means lower piping costs, a lessening of the frequency of piping replacements.

Other factors on the side of "PYREX" Brand Glass include—a remarkable resistance to thermal shock—mechanical strength—transparency that makes continuous visual inspection possible—plus the freedom from discoloration and contamination that only chemically resistant "PYREX" Brand Glass assures.

It's a wise and economical move when you install "PYREX" Piping.

● Use "Pyrex" Piping as insurance against corrosion. Its long life and ultimate economy will amply repay you.

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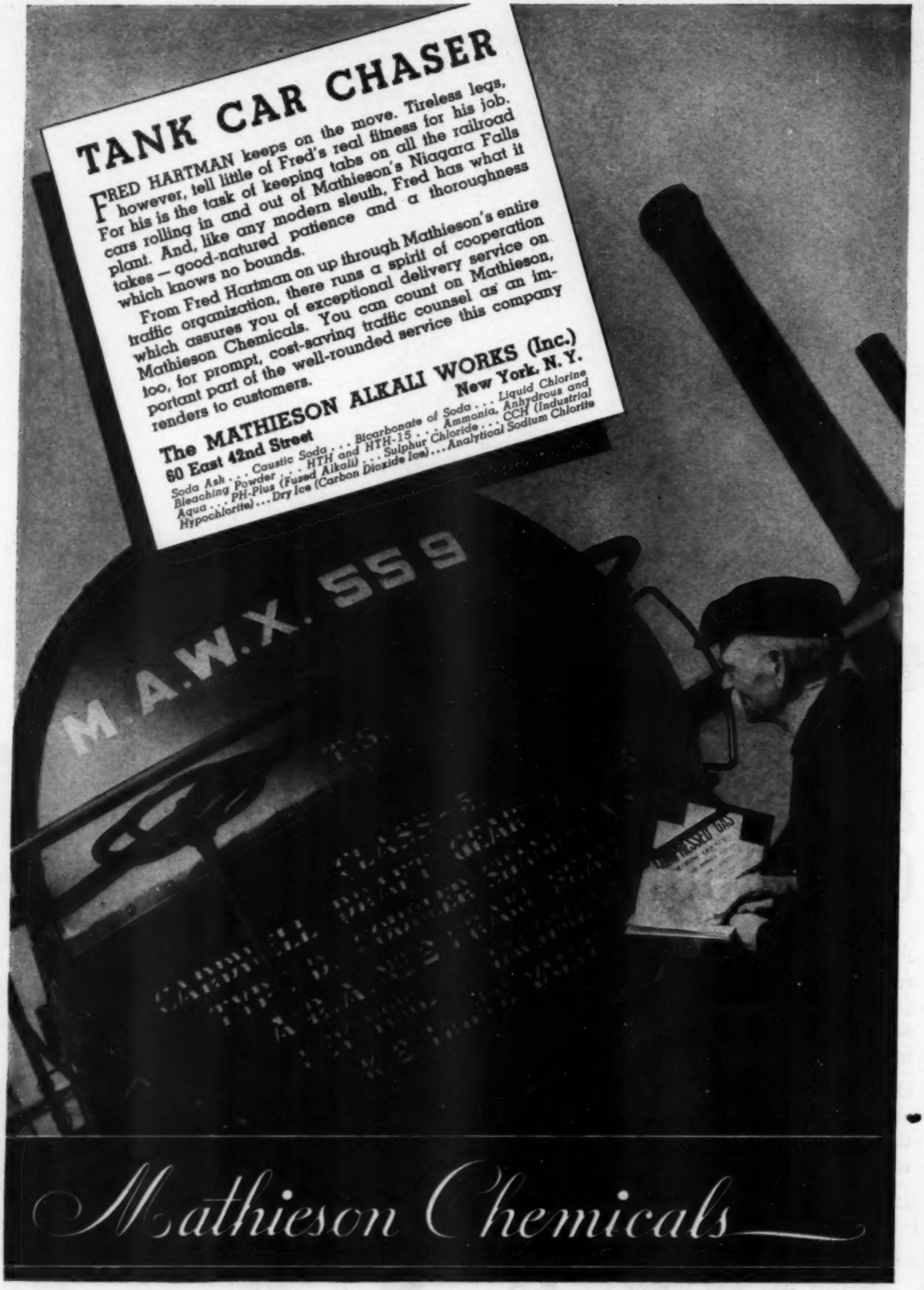
"PYREX" is a registered trade-mark and indicates manufacture by Corning Glass Works


TANK CAR CHASER
FRED HARTMAN keeps on the move. Tireless legs, however, tell little of Fred's real fitness for his job. For his is the task of keeping tabs on all the railroad cars rolling in and out of Mathieson's Niagara Falls plant. And, like any modern sleuth, Fred has what it takes — good-natured patience and a thoroughness which knows no bounds.
From Fred Hartman on up through Mathieson's entire traffic organization, there runs a spirit of cooperation which assures you of exceptional delivery service on Mathieson Chemicals. You can count on Mathieson, too, for prompt, cost-saving traffic counsel as an important part of the well-rounded service this company renders to customers.
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Soda Ash . . . Caustic Soda . . . Bicarbonate of Soda . . . Liquid Chlorine
Bleaching Powder . . . HTH and HTH-15 . . . Ammonia, Anhydrous and
Aqua . . . PH-Plus (Fused Alkali) . . . Sulphur Chloride . . . CCH (Industrial
Hypochlorite) . . . Dry Ice (Carbon Dioxide Ice) . . . Analytical Sodium Chlorite
M.A.W.X. 559
Mathieson Chemicals

General Business Begins to Look Better!

THE first quarter of 1938 business has passed into the record. It will prove to be the poorest quarter of the current year in all probability so far as general business goes, and certainly, the poorest for the paper industry.

The decline in general business reached bottom during the week ending March 5, showing 56.9 per cent of the volume of general business done in 1926, twelve years ago, when we had 13,000,000 less consumers in this country than we have to-day. A year ago, for the week ending March 6, the volume of general business in the country was 80.3 per cent of the 1926 volume, and the paper industry was staggering under mill capacity operation aggregating 100 per cent to 105 per cent in some divisions, whereas for the week ending March 5, 1938, the paper industry's operating ratio was in the neighborhood of 69 per cent when the volume of general business for that same week was 56.9 per cent.

Since the week of March 5, the volume of general business has turned upward. For the week ending March 12, it was 57.1 per cent; for the week ending March 19, it was 57.7 per cent; and for the week ending March 26, it was 58.1 per cent and that finishes the first quarter of the current year, showing a 1.2 per cent increase from the low point of 56.9 per cent.

Of course, one swallow does not make a spring and a slight increase in the general business volume does not make a general business recovery, but it indicates it, for this slight increase taken in connection with other current events, which have a very material influence upon the business volume, inclines us to the belief that the bottom of the recession has been passed and that the balance of the year will show a gradual, but maintained increase in the business volume with the chances in favor of a right smart advance beginning the July quarter of the year.

Now, the reason why we emphasize the changes in the weekly percentage figures of the general business volume barometer is because it is an exact and infallible measure of the confidence that the business men of America have in the political administration at Washington, which has the control and direction of the general business of the country. No one is so blind as not to see that the injection of political control by Washington into the economic operation of the general business of the country is bitterly resented by business men everywhere, and has resulted in bringing us back to the second depression we have had in the past six years.

During the first part of April, we have seen a right-about-face done at Washington.

Washington has at last recognized the country-wide protest which has been registered so emphatically against any farther fumbling of the situation.

The reorganization bill has been so overwhelmingly defeated that its proponents deem it politically unwise to resurrect even a modified version of the bill.

The Senate falls in line by passing a tax relief bill which emasculates the undivided profits taxes and the third basket tax on family-held corporations, and further drastically amends the iniquitous taxes on capital and business expansion—and all this with the advice and consent of the defeated left-wingers and new dealers.

Besides this, we are assured that the administration will not attempt to introduce any more dictator-tinged legislation and will, from now on, co-operate with Congress to restore business confidence rapidly.

Thus, with a confidence restoring co-operative attitude manifested by the formerly antagonistic administration, and an evident determination by Congress to function as democratic representatives instead of rubber stamps for a punitive executive, business confidence will expand and the general business volume will rise, all of which will be reflected in the weekly upturn of the general business volume barometer.

Business has a better outlook for us.

"Business Is Terrible"

DURING recent months, it has become increasingly common for business men, leaders in industry, perhaps important executives in the pulp and paper industry, when questioned as to conditions of business, to retort "Business Is Terrible." There is plenty of evidence to show that the total volume of business in many concerns took a nose dive some months back and that even today, is still in a tailspin. All of this evidence, however, does not prove even circumstantially that all business should be terrible.

There are still some hundred and thirty million of people in the United States that have to be housed, clothed and fed. They also have become accustomed to much more than the bare necessities of life. They want things, both necessities and luxuries, and under ordinary circumstances are going to have them.

Satisfying the wants of these people is the primary purpose of American business and industry. Most assuredly it is a big undertaking that weaves and twists into many ramifications. Yet all business can only hope to prosper in proportion to the effort that is put into it to make it succeed.

Industry cannot function without orders. Orders commonly come only from consistent and conscientious sales effort. When business is good, it is human nature to let up on this effort and to drift with the tide. When business is poor, it is easier to complain, to find fault, to whine and to say that business is terrible than it is to arouse oneself and to go out after it.

For example, in one organization of more than average size that has come to notice, and there are probably thousands of firms in which similar conditions prevail, the volume of business being brought in by some of the star salesmen is far from anything to boast about, while that of a number of cub salesmen has been increasing month by month in spite of the general business recession. What is the reason?

The cub salesmen have the poorer prospects but they work them from morning till night. Their individual orders are small but, in total, they amount to a sizable figure.

The star salesmen, on the other hand, that are failing to bring in a representative volume of business for the most part are not working. One star salesman, as supporting evidence to this fact, arrives at the office about 8:30 in the morning; makes a pest of himself until about 10:00 A. M.; then decides to call on an important customer; makes the call before noon; arrives back at the office before lunch time; wails that business is terrible; finds someone to go to lunch with him; spends two to three hours at lunch discussing the sad state of affairs of business; returns to the office for lack of anything else to do; decides to call upon another important customer; spends an hour or two doing so; returns again to the office bemoaning conditions of business; and finally decides to go home for the day as there are no orders to be obtained.

Maybe the case which has been cited is somewhat exaggerated. Nevertheless, it does indicate a condition that can easily develop in any organization and, because of it, that bares watching.

The answer to better business is summed up in one word and that one word is "Work," or perhaps better still in the beautiful words of Edwin Markham in his poem "The Day and the Work."

"To each man is given a marble to carve for the wall;
A stone that is needed to heighten the beauty of all;
And only his soul has the magic to give it a grace;
And only his hands have the cunning to put it in place."

That Matter of Appearance

HOW does your mill look to the passer-by, to the important customer who visits you infrequently, to your more critical employees, and to yourself? Is it attractive? Is the mill yard clean and tidy? Are the driveways well laid out and designed for the traffic which they must bear? Are the sidewalks kept in good repair? Is the mill yard beautified in any way? In other words, does the mill have a pleaasing and attractive appearance or does it look run down at the heel?

Be impartial. Take a look at it from the viewpoint of the outsider. Are you satisfied with it, or are you of the opinion that perhaps it might be improved.

If you are not satisfied, do something about it. Effect a program of plant beautification without delay. Make your mill an attractive place in which to work. It will do its part in building up an esprit de corps that makes for successful mill operation.

THE SUPERIORITY SHOWS UP IN PERFORMANCE

KEEP MOVING

WITH FAST'S

Like traffic on a busy street, production must keep moving. The stoppage of one machine may halt the entire plant . . . not just one process, not just one department! Couplings—vital in the production chain—carry a heavy responsibility. Fast's, the original and genuine Self-Aligning Couplings, have the dependability that shoulders this responsibility. Years of uninterrupted service in every known kind of application, prove this. The superiority shows up in performance—as thousands of users have learned. Next time you buy or recondition your equipment—get "Fast's." Koppers Company, BARTLETT HAYWARD DIVISION, BALTIMORE, MD.

The illustrations show Fast's construction. The load-carrying surfaces are protected from wear by a positive film of oil. This oil is kept permanently clean by the rocking bearings which make precise metal-to-metal contact and are in the one position where they form permanent dust and moisture proof seals. These vital features are found only in genuine Fast's Self-Aligning Couplings.

FAST'S COUPLINGS

K O P P E R S product

Sibley's Spring Song

WILLIAM SIBLEY

I HAVEN'T the slightest idea what to write about. This is the 173rd consecutive appearance of William Sibley in this space, and probably not more than twice before have I suffered such a severe mental lapse. Mentally, I've run dry. But here it is—publication time and *something* has to be done. Quickly. . . . And what I can do on this beautiful crystal-clear spring day, (when I want nothing so much as to get away from this ocean of asphalt and either pick crocuses or lie down and sleep on the windward, sunny-side of a straw stack) I just don't know. Those fluffy, downy, blobs of cotton sailing through the azure sky fill me to the eyebrows with spring-fever. But here I am banging away (sans thought) on my long-suffering typewriter! Oh me! . . . If ever *your* son shows the slightest inclination toward taking up writing as a profession—put him on a diet of bichloride of mercury!!!

How I would love, right now, to be up there on one of those fleecy clouds. There *are* folks up there, you know. Sure enough! Didn't you know that? Everyone of those clouds is peopled with literally hundreds of thousands of tiny raindrops—some of them riding on the very edge of the cloud—with their feet hanging off and dangling into space. Most precarious position—but who cares, the sun is so bright and warm.

OOPP! Look out there! Right up there in the Northeast a couple of clouds just had a collision, and the bump knocked off a whole gang of those raindrops which were riding on the feather edge of the clouds. And there they come—tumbling down to earth—tumbling over and over and over again—laughing all the time. Some of the raindrops get to falling so fast they almost lose their breath, but even so, the sun is still shining, and so who cares! . . . And KERPLUNK! they land on the roofs, still giggling like the carefree pixies they are.

Then, on the roof, they rest a moment or two, gathering themselves together for the adventure of exploration that is ahead of them. Leisurely slipping down the shallow slope of the roof they finally tumble into the eaves-trough and proceed until they are surprised and astonished to the point of gasping at being dropped through the downspout and out into the gutter of the street. UGH! The place is all dirty! The raindrops' faces get smudged and soiled and they not only look dirty but feel dirty. This is no fun! Can't they get away from this awful gutter?

Why, hurray!!! Here is the end! The street gutter emptied smack into a little creek. Gee! This is swell. So clean and sparkling and bright that the raindrops can wash their faces and get all cleaned up. . . . And travel leisurely in the bright sunshine down toward the river. . . . Right through the mill pond and past the stone quarry they go; on and on until they find themselves far out in the fields and meadows—the same ones they saw so far below them when they rode on the clouds above.

It's fun to be a drop of water in a meadow-creek in the springtime. Just laze along in the sunshine flirting with the overhanging willows and washing the newly sprouting fern fronds. And it is even more fun when the creek bed drops away rapidly and they get to running down hill—faster and faster. . . . Especially when the creek bed is floored with clean gravel and smooth stones. At first the raindrops play leap-frog with each other, but now and then they stumble over an unseen stone—and that tickles their ribs something fierce! The stones and gravel really *are* ticklish! Indeed the drops get to laughing so hard, and running so fast, that they all get to giggling and laughing almost hysterically. And as they stumble and tumble over the stones the chorus of raindrop voices says: "Melody - melody - melody - melody - melody - melody - melody." That's the song of the raindrops as they run and dash along the stony creek bed. Just "Melody-melody-melody-melody-melody."

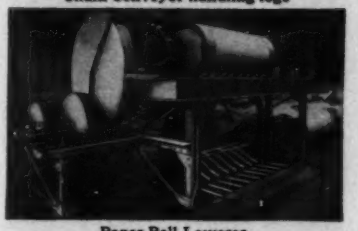
But this afternoon is so very fine and the air is so clear and the song of the creek so infectious that the little seventeen-year-old girl, here in the meadow of her Uncle George's farm (she's visiting her Uncle George during her spring vacation) sits along the bank of the creek watching the raindrops race by. And she's interested, even fascinated, by the song of the creek. It is so strange to her. The little lady has always lived by the restless ocean which always seemed to her either to be too placid or too boisterous. Certainly she never before heard this "Melody-melody-melody-melody-melody" song.

Suddenly the little lady is inspired by the song of the creek to pick herself up off the soft grass, quickly grab her handful of wild flowers, and race back to the house. What for? Why she just thought of the huge conch shell that Aunt Julia has in the living room. Racing home, she picks up the conch shell—then with it runs back to the creek. Reseating herself by the side of the creek she listens first to the "melody-melody-melody" song of the creek, then to the song of the conch shell: "chord-chord-chord" that forever rumbles imprisoned in the hollow shell.

My goodness! "Melody-melody-melody." "Chord-chord-chord." Maybe, that's the way music was born.

Mills Everywhere use LINK-BELT CONVEYORS AND TRANSMISSION EQUIPMENT

Chain Conveyor handling logs

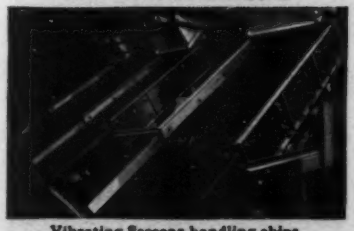


Paper Roll Lowerer

Screw Conveyor handling pulp

Silverstreak Silent Chain Drive

Self-Aligning Belt Conveyor Idler



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P. I. V. Gear variable speed transmission

Bearings, Collars, Hangers, Pulleys, Take-ups

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The Link-Belt Roto-Louvre Dryer

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Our technical department will gladly assist you in your valve problems.

POWELL VALVES

THE WM. POWELL CO. CINCINNATI, OHIO

ENDURING STRENGTH

Powerful . . . rugged . . . strong-hearted and enduring . . . Dayton Cog-Belts stand up and carry on where other drives succumb to hardship and fatigue. These long-lived Dayton Cog-Belts have sinews of stout cable cords and muscles of resilient rubber compounds. Their patented, exclusive construction gives them deathless grip and pulling power. Daytons wedge themselves in the pulley grooves! There's no stretching, slipping or squashing to weaken their driving force. Daytons transmit full power . . . keep machinery going at full speed. Daytons ride straight and run true. No writhing and whipping. No chafing and heating. Just smooth, silent, shockless, dependable *power!* Save space and maintain peak production! Lower upkeep and reduce replacement costs! In other words, use Dayton Cog-Belts. Call your local Dayton Distributor or write us for catalogs and data.

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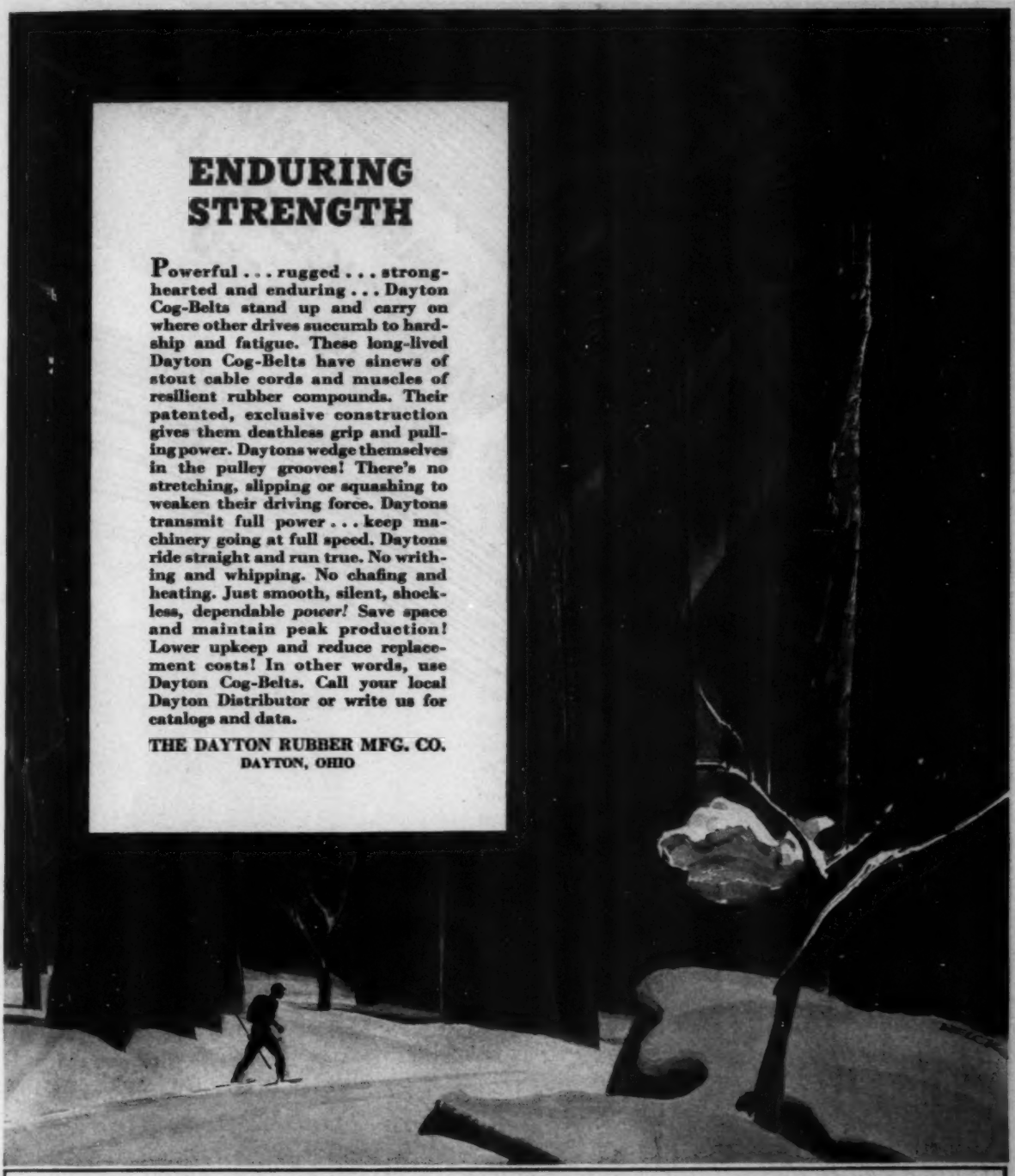
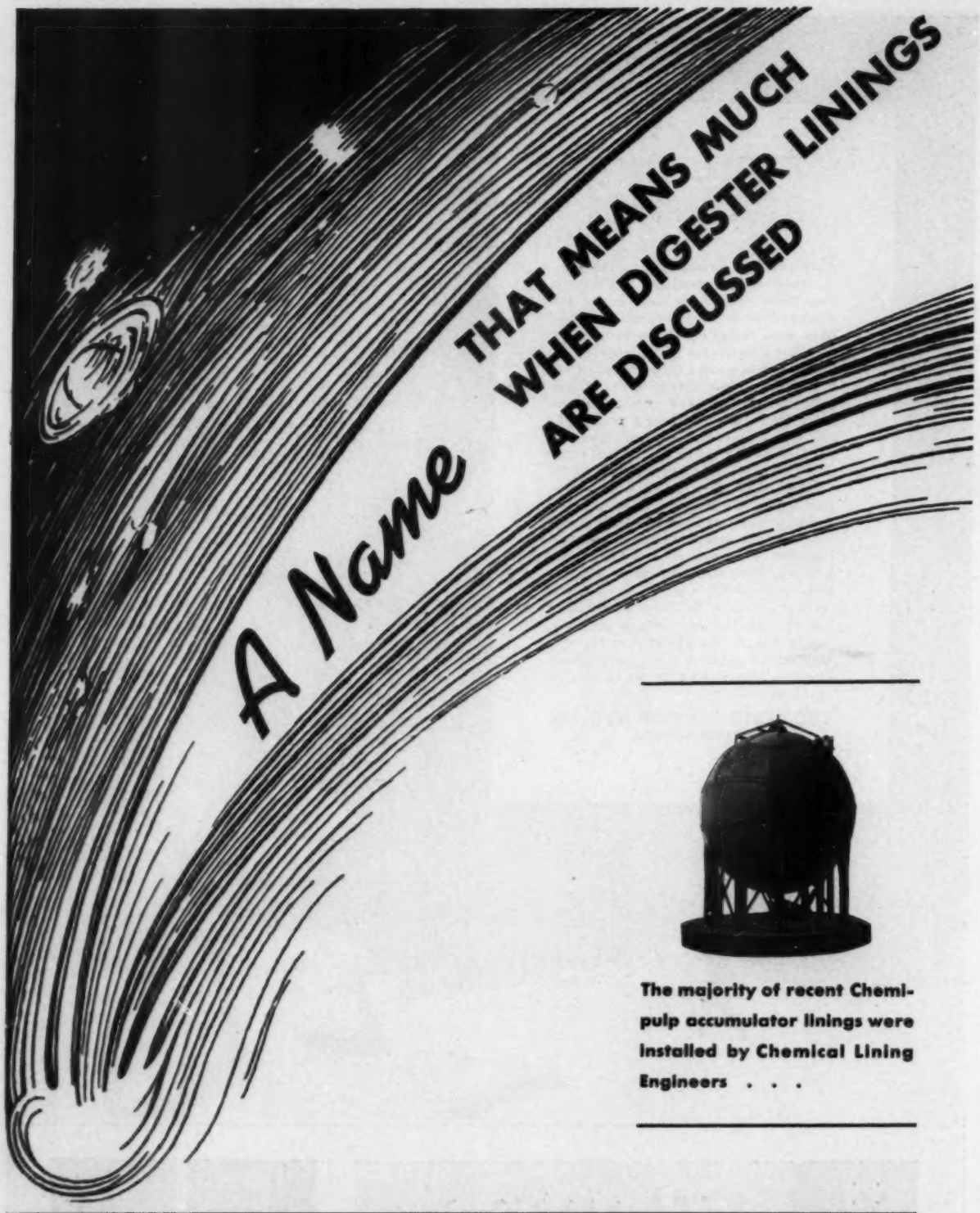


Dayton

COG-BELT DRIVES



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ACID AND ALKALINE CHEMICAL RESISTING LININGS
832 BUILDERS EXCHANGE : MINNEAPOLIS, MINN.

GOULDS PUMPS

STARTING WITH GOULDS FIG. 3105—the finest centrifugal paper stock pump built today for stock up to 6%, the Goulds line includes—

"CLOSE-CUPLD" CENTRIFUGAL PUMPS—for low cost miscellaneous service in paper and pulp mills and converter plants. Extremely efficient.

WILL MAINTAIN 24-HOUR SERVICE IN YOUR PLANT....

Name any process operation in a pulp and paper mill, and you will find in the Goulds line of paper mill pumps, units built for the job.

When a pump makes good in a paper mill, it does so by demonstrating its ability to operate 24-hours a day—six days a week—without shutdowns for adjustments or repairs.

That's why the Paper Industry prefers Goulds Pumps. When you buy a Goulds you know you're buying the most efficient, the most economical pump that engineering experience can build.

For more than half a century Goulds has been building pumps for the Paper Industry—always improving, trying, testing, until today these pumps could hardly be improved. Write for Bulletin 206.

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MULTI-STAGE CENTRIFUGAL PUMPS—for boiler feed service, with pressures up to 370 lbs. Widely used for spray, shower, and general water supply.

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Unusually strong and rugged and with features designed for added service life these 125 lb. SP bronze gate valves offer many advantages to valve users.

Double Wedge Disc
Taper Seat
Rising Stem

Non-heat, easy grip, malleable iron handwheel.

Stuffing box is deep and well packed. Hexagon head gland in all sizes.

Hard bronze stems with long powerful thread, accurately machined.

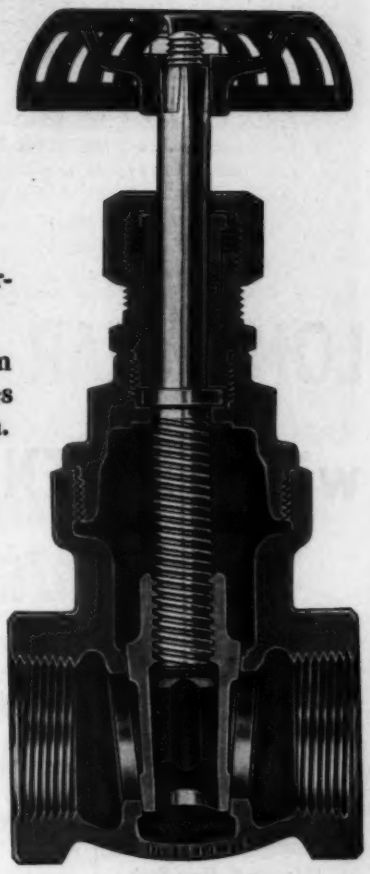
Perfectly machined surfaces form tight seats for repacking valves under pressure when wide open.

Heavy wide flats on bonnet provide firm wrench hold even on smaller sizes.

Bonnet collar is exceptionally sturdy and provides tight body-bonnet joint.

Disc wing guides and body guide channels are beveled to insure easy assembly.

Bodies have full flow straightway areas. Long pipe thread and ample clearance at end of thread prevent pipe ends from jamming against seats.



Single Wedge Disc
Taper Seat
Non-rising Stem

For detailed design and construction features write for circular No. 544

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CINCINNATI, OHIO, U. S. A.
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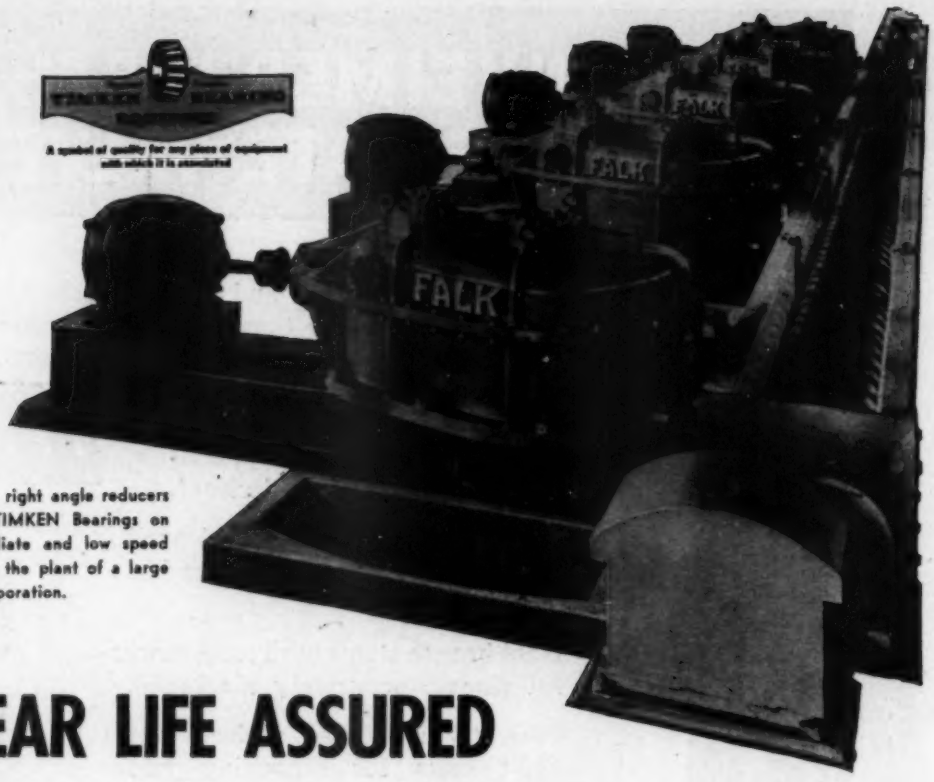
BOILER MOUNTINGS — LUNKENHEIMER VALVES — LUBRICATING DEVICES



Falk double reduction right angle reducers —equipped with 6 TIMKEN Bearings on high speed, intermediate and low speed shafts—as installed in the plant of a large pulp corporation.

LONG GEAR LIFE ASSURED

with TIMKEN Bearings in Speed Reducers

"Mercury" New York Central Lines . . . one of the latest TIMKEN-EQUIPPED Streamliners.

The use of TIMKEN Bearings in speed reducers is an assurance to the buyer that he is getting the maximum in performance at the lowest operating costs. When speed reducer shafts are mounted on TIMKEN Bearings, bearing wear is negligible, and correct gear contact is maintained. With these advantages prevailing, paper manufacturers are assured of long speed-reducer life with smooth, quiet, efficient performance. It pays to specify "Timken Bearing Equipped".

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

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TAPERED ROLLER BEARINGS

Profitable Printing Begins at the Wet End of the Paper Machine

WHETHER A SHEET OF PAPER is to be machine finished, sized and super-calendared or coated, its printing qualities are determined largely by the Wet Cylinder Felt that picks it up as it leaves the Fourdrinier wires. • By removing the excess water faster and more uniformly Hamilton Felts speed production, reduce costs and make better printing papers. Their soft, fleecy nap carries the speeding sheet securely on its way to the drying rollers yet carries it so gently that no impressions from its warp and weft mar the printing surface. • Thus printers and lithographers and their customers no less than paper manufacturers profit from the contribution of Hamilton Felts.

From the thinnest tissue to the coarsest board, there is a Hamilton Felt that will assure increased production and reduced costs

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• Miami Woolen Mill, Established 1858 •

Hamilton Felts are marked by two blue lines full width of the felt and by one shorter blue line midway between them.

Hamilton Felts

THE "Extra-Service" Lead

Extra service in extra-difficult situations — that's the net of the Tellurium Lead story. This lead welcomes tough assignments—thrives on hard knocks.

Many of Tellurium Lead's best service records have been made in plants handling acids under conditions of extreme severity. Users report increased resistance to sulphuric and other corrosive acids, even at temperatures that tend to approach the melting point of the metal. In plant after plant, it has prolonged the life of equipment . . . and reduced the number of shutdowns for repairs.

Another highly important property of Tellurium Lead is this: *It toughens under stress.* When rolled, stretched or hammered, it actually becomes stronger. As a result, turn-over points and joints are less subject to cracking. Furthermore, where vibration occurs, this capacity to develop latent strength minimizes buckling and creeping. This same quality also gives Tellurium Lead improved resistance to fracture due to repeated heat changes.

Tellurium Lead of our manufacture is time-tested St. Joe chemical lead alloyed with a small quantity of tellurium. It gives the advantages of this well-known chemical lead plus important new ones. Yet now, due to a price reduction, it costs only a fraction of a cent more per pound than chemical lead. Available in sheets, pipe and coils. For further facts, write our nearest branch.

Typical User Reports

"1¼" x 6 lbs. Tellurium Lead coil is used in a bath of 10 to 20% sulphuric acid and water with a steam pressure of 5 to 15 lbs. and a temperature of 170° F. Tellurium Lead has not shown any signs of oxidization after four or five times the length of service of lead formerly used."

"We have been using Tellurium Lead in steam injector pipes for acid service," another user reports. "We find that the material has a distinct advantage over lead formerly used. It gives the added rigidity and resistance to deformation needed under the conditions present."

NATIONAL LEAD COMPANY

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Tellurium Lead

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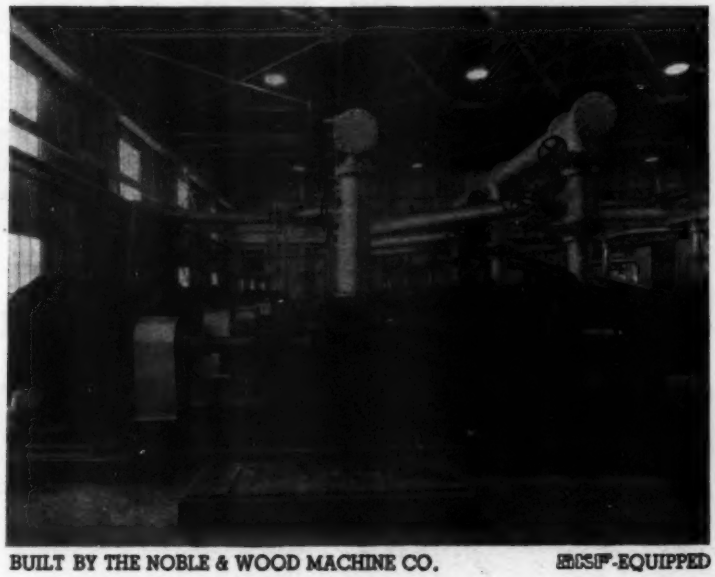

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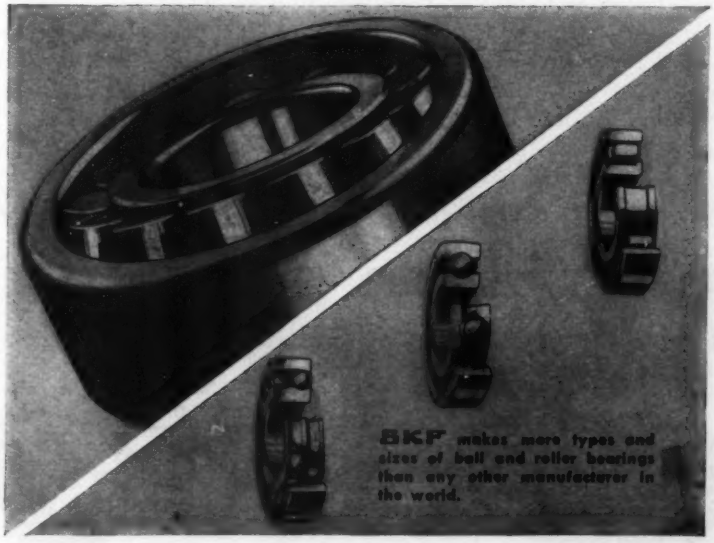

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A MONTHLY EDUCATIONAL JOURNAL

Employee Magazines

G. W. PHILLIPS
The Champion Paper and Fibre Co.

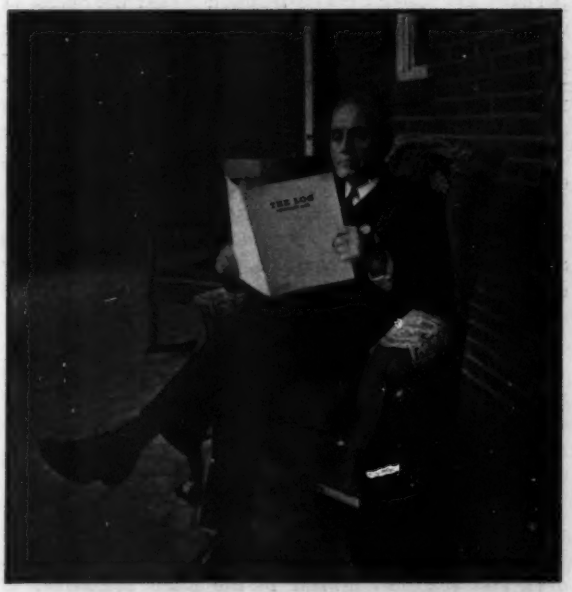
THE history of magazines may be said to date from the seventeenth century. In 1665, both France and England published what are conceded to be their first magazines, the *Journal des Scarvans* and the *Philosophical Transactions of the Royal Academy*. In 1741, nearly two hundred years ago, Benjamin Franklin published the first American magazine, called the *General Magazine*, which was short-lived.

Magazines may be divided into three classes; those chiefly devoted to general literature, those devoted to science and art, and employee magazines which are devoted to items of interest to employees connected with business organizations.

The employee magazine, plant magazine or house organ, as it is called, had its origin somewhat similar to the literary and scientific magazines. The early literary magazine was merely a catalogue of books and pamphlets. The employee magazine in its early stages, contained articles of interest to both employees and customers.

In the December 1929 issue of *The Kalands*, published by the Williams and Wilkins Company of Baltimore, there is an item which seems to indicate that *The Lowell Offerings* was the first employee magazine published. The article reads as follows:

"The first house organ of which there is knowledge was *The Lowell Offerings*, published in October, 1840, in Boston. This paper came into existence for one purpose, to provide a medium for the literary contributions of the young men and women who were employed in the cotton mills of Massachusetts. These young people came from homes firmly founded in wisdom where they had been taught the dignity of labor. Consequently, they entered their work with high ambitions and the will to improve themselves by study and social contact.



A Champion employee reading "The Log"

"One of these girls, Harriet F. Curtis, organized a society for 'mental improvement' and 'to improve the talents God has given us.' At the meeting of this society, papers written by the various members were read and discussed. Interest became so keen in the organization

that it was suggested that the papers be published and distributed to employees in the mills, thereby increasing their interest in each other and their work. The record tells us that its success was 'instant'.

"Down through the years with the varying economic changes in every way, it is interesting to note that the fundamental purpose of this early house organ still holds good, and that is to bind more closely together in interest, ambitions, and good-will those individuals who make up the business organizations of today." (Through the courtesy of the Metropolitan Service Bureau the above information was secured.)

It is claimed that *Poor Richard's Almanac* was the house organ for the print shop of Benjamin Franklin, and that the employee magazine published by the H. B. Smith Machine Company of Smithville, New Jersey, was first issued in 1847. So it seems, that the employee magazine idea is not a product of this modern age, but nearly a century old.

It seems to me the employee magazine is the most practical way to develop the family spirit in an organization. Through its columns, employees can be bound together more closely in interest, co-operation, teamwork and good will. Quite often, in a large organization, employees may work for a quarter of a century and never know each other. But, through the personal column and departmental news, they read about each other, though they may never meet in a social way, and become interested in one another's welfare. There is, perhaps, no better avenue through which the spirit of co-operation between management and men can be developed than through the employee magazine. Perhaps, if it were not for the desire on the part of management to make more pleasant the relations between men and management and develop the family spirit in organizations, there would be no such thing as an employee magazine.

The employee magazine helps to bring to a common understanding the advantages, difficulties, pleasures and sorrows of the members of an organization, thereby developing a sympathetic and co-operative spirit toward each other, and a desire to help one another bear the burdens of life.

Pictures of employees, family groups, children and places of interest, not only improve the appearance of the pages of employee magazines, but enhances the interest of employees and members of their family in the magazine.

Old employees, as well as the young, like to see their pictures in the magazine. Nothing pleases the family more than to see pictures of their children, grandchildren and relations appear in the plant magazine. A large number of our employees have in their possession today copies of our employee magazine, *The Log*, more than fifteen years old. These magazines have been kept for various reasons perhaps. Some of our employees, no doubt, have a complete file of all issues over a period of years; others have in their possession copies which they treasure for sentimental reasons or a bit of information. Recently, one of the superintendents came to the author for a copy of the August 1927 issue of the company's employee magazine. There were no copies to spare, but the party obtained a copy from a neighbor who had two copies. Another employee stated that he had a copy issued twenty years ago. The Champion Company's magazine, *The Log*, was first published in May 1914.

There is no better channel than the columns of the employee magazine for transmitting news of athletic events, social activities, safety, company policy and other information interesting and helpful to employees and members of their families.

The employee magazine can be a useful medium in developing and fostering a spirit of cooperation and teamwork so essential in an efficient organization. Loyalty, good-will and good-fellowship are similar to tender plants subjected to the hot rays of the sun without proper protection. Plants, loyalty, good-will and good-fellowship will soon perish unless properly nourished. The employee magazine can encourage and be very helpful in building and encouraging such a spirit.

Without an employee magazine it is difficult to develop the spirit of safety in the plant and in the home as it should be. Bulletin boards or group meetings never seem quite so effective as the printed page. When an employee or a member of his family sits around the fireside, reads and discusses a safety message, the author is of the opinion, that employees think more seriously about self-preservation, and, no doubt, a word of caution from the good wife or child is more impressive than a word of caution from the superintendent or foreman.

Last, but not least, an employee magazine should carry in each issue a feature article which is of interest to those outside of the organization, as well as employees. These articles should be of an instructive nature. Employees want something beside plant news. The chief, or manager, of a hotel dining room or eating place has learned from experience that an appetizing meal is made up of a variety of good things to eat. For instance, the menu may consist of a cocktail, soup, salad, meat, vegetables, bread and butter, coffee, tea or milk and dessert. An employee magazine also should cover a variety of subjects. This will be likely to interest a larger number of people in the magazine.

Of course, the problems in each organization are somewhat different, and have to be handled in a different way, but in many cases it has been found that money spent in publishing an employee magazine is returned many-fold. It may be difficult sometimes to prove to some hardheaded business men that such an investment pays. However, the same is true in regard to safety effort, and practically all personnel activities.

Today, social problems are agitating the minds of employee and employer, and instead of drifting farther and farther apart, employee and employer should become more closely united—because the interest of both are identical. When the employer prospers the employee has regular work, and when the employer fails the employee is thrown out of work, and as a result he and his family suffer.

Some newspapers, radio talks and labor agitators have poisoned the minds of a large per cent of the people against employers. The employee magazine can be used very effectively in presenting the facts to employees, and as a result employees are not misled and both employee and employer profit.

Dissolved Alum vs. Dry Alum*

ALUM, the papermaker's friend, is also one of his worst enemies. It helps him out of his difficulties and plunges him into others which he knows not of, and which may be even more serious. With it he can make sized paper—if he is lucky—but within thirty or forty years this paper may be crumbling to dust because alum was used too freely. The chemist tells him to use as little alum as possible to get the desired sizing while the "practical" papermaker adds a little more to prevent the stock from sticking to the presses, a little more to "set the color," a little more because the stock is frothing, and finally a little more just to be sure there is enough. Eventually, of course, this is tough on the paper, and on all equipment which is subject to corrosion, including the papermaker's pocket book.

Why, then, should we give any thought to the problem of dissolved vs. dry alum? Is there any reason why one is, or should be, superior to the other? Since the use of this necessary evil cannot be avoided, it is certainly wise to see if it can be used any more intelligently or successfully in one way than another.

From the standpoint of efficiency no reliable data are available. Considering the very great number of factors which may affect the sizing results it is not difficult to see why this is so, for it is nearly impossible to hold all but one of them constant, so that its effect can be determined. In all probability alum efficiency, as based on the amount used or its cost, depends more on psychology than on chemistry. In other words, the attitude of the boss toward the use, or abuse, of alum has far more influence on the amounts used than any change in the methods of its application. Such being the case it seems to be largely a question whether the workmen are likely to be more careless in its use if it is handled dry or in solution. Are they more likely to waste by leaving the valve open too long or too wide, or by weighing out too much, or even shoveling in too much without weighing at all? The answer to that is anyone's guess, but mine would be that it is easier to leave a valve open than it is to carry extra alum to the beater and dump it in.

Theoretically there can be no great fault found with the claim that a dilute alum solution, properly added to the beater and well mixed with the stock, should give better results than dry alum, dumped in by the bucketful and allowed to mix for perhaps 15 minutes before dumping the stock. Actually this point is hard to prove, though easy to argue about, and it would seem that papermakers have not taken the time and trouble to make conclusive comparisons. If they have, they have not been public spirited enough to publish the results where they would be available to those thirsting for information.

A number of the recent sizing processes specify the continuous use of alum at the jordan engine, the headbox of the paper machine, or some other place. Whether these processes will find a permanent and important place in papermaking remains to be seen, but, if they do, it would seem that a uniform supply of alum can be assured better if it is applied in the form of a solution rather than if it is added dry. This may be slandering the dry feeders, but it can certainly be claimed for the solution that it gets to work more quickly than dry alum, which needs some time to dissolve before it can perform its proper functions.

If alum is to be added in such a way as this, the best procedure would seem to be to add it at the head-box in the form of a solution and have its flow regulated automatically by a pH recording and controlling device. Installations of this sort are already in operation and are proving very satisfactory. They not only aid sizing by maintaining uniform conditions but they also reduce alum consumption by eliminating the waste caused by personal carelessness.

Probably the argument in favor of dissolved alum which will appeal to most papermakers is that of cleanliness. No manufacturer has yet succeeded in making an alum which is entirely free from insoluble matter. In most cases this is not objectionable, as it is chiefly finely divided silica with perhaps traces of aluminum hydrate, but it may prove serious in certain special cases. In addition to this there is always the opportunity for objectionable insoluble matter to be added before, during, or after shipment. There is always the danger of bags breaking during shipment and on arrival at the plant it is not unusual for the spilled material to be swept up and included with the bagged portion. The bags themselves may contribute to the insoluble material through the rubbing off of some of the fibers, or from not having been thoroughly cleaned when they were filled. The twine used to tie up the alum bags may easily get into the alum and thence into the beater. A properly designed dissolving and screening system will help to minimize these causes of dirt, but even such a system must be given regular and proper care if it is to operate successfully and not give merely a false sense of security.

The only valid argument against the use of dissolved alum seems to be the investment necessary to install solution tanks, feed lines and measuring devices. The actual cost for this is a special study for each plant, but it should not be prohibitive for a plant making a high grade product. If the pH controlling equipment is included, the expense, of course, will be materially increased, but the elimination of waste should quickly save enough alum to pay for the equipment. This remark applies to those plants which use alum with a reasonable degree of carelessness. There are, perhaps, others where control is already so rigid that no appreciable saving can be expected from a pH controlling unit, but it is believed that these are few and far between.

(*) This article is not staff written. It was prepared on assignment by one of the industry's best known chemists. He requested it to appear as an anonymous contribution.

Glued Seams for Fourdrinier Dryer Felts

JOHN V. ZIEMANN, General Superintendent
Southern Kraft Corporation*

IN July 1936 glued fourdrinier dryer felt seams were introduced at the Southern Kraft Corporation's Marinette mill and won immediate approval on the basis of both operation and economy. Since then glued seams have been used almost exclusively, exceptions being in case of seam failure during the operating week, which now happens very infrequently, and also in case a new felt must be put on during the week. The time required for making a good glued seam is about two hours for making the seam and three to four hours drying time. This time requirement makes it necessary to sew a seam during the

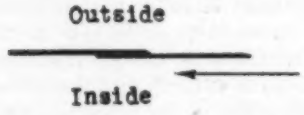


Figure 1

week in order to minimize shutdown time. In such a case the felt would be glued during the following week-end shutdown. Glued seams are satisfactory on both new and used cotton and cotton-asbestos felts.

Approximately seventy-five per cent of the seams made on new felts will run the life of the felt; the other twenty-five per cent require one additional glued seam to complete the run. These failures are due to the

Figure 2

Sanding felt ends to receive glue. Note spacer strip in place

weakening of the threads at the edge of the lap rather than failure of the glued surfaces. Shutdowns due to failure of this type of seam are rare, because the beginning of the failure is usually detected by inspection during shutdowns made for other purposes. In case a seam should begin to fail during the week, it would be reinforced with sewing to make it run until the week-end shutdown, at which time a new glued seam would be made.

A decided advantage in favor of the glued seam is the increased production obtained by: first, reduction of down time for re-sewing seams; and second,

Figure 3

Seam positioned by spacer strip

and more important, less broke is made, especially on light weight sheets where the flap of the sewed seam may break off the sheet before it is dried, or it may crack the edges of the wet sheet and cause breaks at the dry end when the paper leaves the dryer section or in the calender stacks. Breakdowns of the sheet traceable to felt seams have been entirely eliminated.

Increased felt life to the extent of thirty per cent is being realized. Because the tension is evenly applied and there is less flexing of the felt threads, the glued seam will hold on a felt that is too worn and weakened to hold a sewed seam.

The splicing procedure in use at the Marinette mill is as follows:

Square and Cut Felt

First, the felt is slacked off as much as possible. Then both ends are cut at a 90 deg. angle to the edges. Accurate squaring of the ends is very important in preventing the formation of wrinkles. A bottom felt can usually be squared and cut on the floor, whereas top felts are handled on cross planks laid on supports attached to the machine frame by means of clamps.

Fasten Felt on Planks and Apply Spacer Strips

The seam is made in such a way that the end exposed on the outside of the felt trails rather than

(*) Continental Division, Marinette, Wisconsin.

leads the lap (Figure 1). To make such a seam, two 3 in. by 6 in. crossplanks, laid flat, are arranged close together in parallel and horizontally at a convenient working height. Then one end of the felt is brought up between the two planks, while the other is brought up over the back of the rear one. Each end of the felt is next pulled forward until it is even with the far edge of the plank immediately in front of it. A row of roofing nails is then driven through each of the cut ends of the felt, about 4½ in. from each end, to hold the ends in place. After driving these nails, a ¾ in. x 1 in. wood strip, one for each of the felt ends, is nailed down on the felt 3½ in. back from its respective end; to act as a spacer for the width of the lap. This procedure simplifies the application of glue and makes the lapping more accurate.

Prepare the Surfaces

The surfaces which are to receive the glue are now sanded with a portable electric belt-type sanding machine using a coarse grain paper (Figure 2). The sanded surfaces absorb the glue more rapidly than would the smooth felt, and the nap produced by sanding increases the bond between the glue and the fabric. The thickness of the felt is not reduced appreciably except at the cut edges where it is sanded down to about one-half of the original thickness and tapered back about three-quarters inch from the cut end. All lint should be carefully brushed off after the sanding operation. Carbon tetrachloride may be used to remove grease when old felts are to be glued.

Apply the Glue

Approximately one-half gallon of a heat resisting glue for cotton and asbestos dryer felts is required for a 3½ in. x 112 in. lap splice. One pint of the glue is used on each end for a first coat. This quantity is poured on and worked into the fabric as much as possible with a paddle, ten to fifteen minutes, depending on absorbency of the felt and room temperature, being allowed for penetration and skin drying. A second coat, using about one-half the amount of the first coat, is then applied evenly and allowed the same drying time as the first coat. A third and final coat, using the same or slightly less glue than the second coat, is next applied; and the lap then joined as quickly as possible.

Figure 4

Pressure applied to seam

Join the Laps

To make the joining, the narrow wood spacer strip and nails are removed from the felt end, which is to be laid on top. This end is then turned over and butted against the other spacer strip, where it is nailed into the bottom plank to hold it in place (Figure 3).

Fig. 5

Glued seam after 53 days of operation

Apply Heat

After the joining, a heavy heated iron is passed over the seam for five minutes or more. This operation may not be necessary but the concept is that it probably increases penetration of the glue into the fabric.

Apply Pressure

The plank, released from the upper half of the lap, is next laid on the seam and clamped as shown in Figure 4. One hour is allowed for partial drying or setting of the glue. Then the planks are removed and an additional two to three hours allowed for thorough drying.

Sew the Edges

It is advisable to reinforce the edges of a glued seam with sewing or rivets. The practice at the Marinette mill has been to sew them, but riveting is being contemplated.

Figure 5 shows a seam on a short two-dryer wet-end felt after fifty-three days of operation. One felt ran 127 days on tissue at a speed of 850 feet a minute. When the felt was removed because of wear the original seam was in excellent condition.

A Consistence Slide Rule

O. K. GRAEF

IT IS commonly necessary for pulp and paper workers to calculate various factors concerning the consistence of pulp suspensions in water. There are tables existing which are in common use, but in many cases a slide rule to solve these problems may be of considerably more value than a table.

The basic formulae underlying these tables are:

$A = 138.8/C$
$B = (100/C) - 1$
$D = 16.62/C$
$E = 11.97/C$
$F = .1199\ (100/C - 1)$
$G = 2.22/C$
$H = 1.6/C$
$K = 0.0834C$
$L = 0.625C$
$P = 2000\ F = 2F \times 1000$

Where C is the percent consistence, or pounds of dry stock to 100 pounds of liquid.

A — Pounds of liquid per minute per ton of dry stock per 24 hours.
B — Pounds of water per pound of stock.
D — Gallons of liquid per minute per ton of dry stock per 24 hours.
E — Number of gallons containing 1 pound of stock.
F — Gallons of water per pound of stock.
G — Cubic feet of liquid per minute per ton of dry stock per 24 hours.
H — Number of cu. ft. containing 1 pound of stock.
K — Pounds of dry stock in 1 gal. liquid.
L — Pounds dry stock in 1 cu. ft. liquid.
P — Gallons of water per ton of stock.

The first step is to throw the formulae into the basic form for slide rule plotting:

$\text{Log}\ (138.8/C) - \text{Log}\ A = 0$ (1)
$\text{Log}\ (100/C - 1) - \text{Log}\ B = 0$ (2)
$\text{Log}\ (16.62/C) - \text{Log}\ D = 0$ (3)
$\text{Log}\ (11.97/C) - \text{Log}\ E = 0$ (4)
$\text{Log}\ (0.1199\ (100/C - 1)) - \text{Log}\ F = 0$ (5)
$\text{Log}\ (2.22/C) - \text{Log}\ G = 0$ (6)
$\text{Log}\ (1.6/C) - \text{Log}\ H = 0$ (7)
$\text{Log}\ (0.0834\ C) - \text{Log}\ K = 0$ (8)
$\text{Log}\ (0.625\ C) - \text{Log}\ L = 0$ (9)
$\text{Log}\ (2F) + \text{Log}\ 1000 - \text{Log}\ P = 0$ (10)

From an inspection of the above relations, it will be observed that formulae (1) to (7) inclusive, indicate increasing values as the value of C decreases. On the other hand, (8) and (9) will give increasing values as C increases. In other words the values of the former vary inversely as C while the latter vary directly as C. Formula (10) has not been considered independently as it is merely (5) multiplied by 2000.

Both an increasing and a decreasing function cannot be accommodated on the same scale at the same time, and therefore it will be necessary to provide separate scales, increasing in opposite directions, in order to accommodate the two types of scale necessary.

For the purpose of determining what type of rule to use, note that all of the formulae in the group (1) to (7), fall into the general type $f(a) - f(b) = f(c)$, while (8) and (9) are of the type $f(a) + f(b) = f(c)$. Now a plain single slide, slide rule will solve the equation $A \pm B = C$; or if an index is not used will solve, $A \pm B \pm C = D$. The consistence equations are all of the first type with one of the terms to the left of the sign of equality a constant. Normally, a simple scale such as shown in Figure 1 will solve equations of this type, no slide being necessary. In this case, while the formulae are of this form individually, collectively they form an equation in which the constant is actually a variable term which depends upon just what dimensions the final result is to be expressed in, i.e., pounds per gallon, pounds per cubic foot, etc., and with this in mind the formula for plotting the slide rule may be written;

for (1) to (7) $-\text{Log}\ C + \text{Log}\ k - \text{Log}\ M = 0$ (11)
and for (8) and (9) $\text{Log}\ C + \text{Log}\ k - \text{Log}\ M = 0$ (12)

Where k — a constant whose value varies with the dimensions of the quotient desired.
M — the quotient or product, expressed in the desired dimensions.

On an index type slide rule, the position of the index varies with the value of the index. That is, constants in a slide rule plotting only serve to fix the location

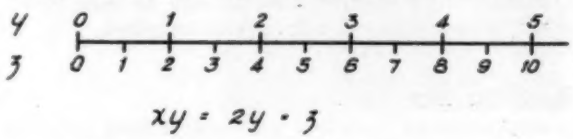


FIG 1.

of the index points. Then if the constants are arranged in the order of their increasing values, a separate index may be arranged for each of the formulae it is desired to solve for, and hence the index becomes rather a series of indices, or it may be called an index scale. Then if a C scale of proper length is provided, with an index to mark it on the slide, and an index scale arranged to read upon a master scale on the lower section of the rule stock, then all of the above formulae, (1) to (7), may be solved for simultaneously.

As before noted, (8) and (9) advance oppositely to (1) to (7), and therefore another scale or scales must be provided. It will not do to simply place this scale below the master scale, because then a rider would have to be provided to make the lower scales readable, thus leading to unnecessary complications in the construction and making the rule more difficult to use. It is better to make up these two scales separately and place them in the groove of the rule, underneath the slide. The end of the slide then becomes the index for these two scales.

A key must be constructed for the direction of increase of the scales, and arranging the terms of the equations according to their appearance in (11), which will also be the order of their appearance on the rule.

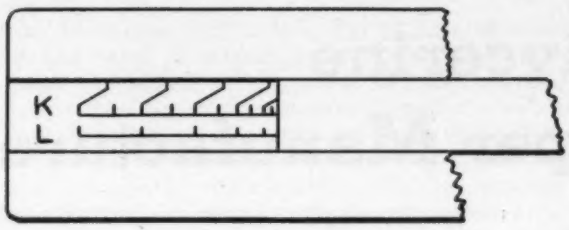


FIG. 2.

Plus and minus signs are to be placed alternately before and after the terms of the equation without regard to the actual sign of the term. Arrows are then placed to point away from the sign which corresponds to the actual sign of the term in the equation:

Top section of rule stock	$+ C - \rightarrow$
Top half of slide	$- \text{Index} +$
Bottom half of slide	$\leftarrow + k -$
Bottom section of rule stock	$\leftarrow - M +$

The scales in the groove use the common C scale, and therefore the key for these scales must necessarily start with the previously determined C scale.

Top section of rule stock	$- C + \rightarrow$
Slide	$+$ Index $-$ / $-$ Index $+$
Bottom of groove	$+ M - \rightarrow$

In this case only one index is indicated on the slide, and this is for the reason that an index appears on the upper edge of the slide, but the end of the slide is also being used as an index. This in effect is only a single offset index, the K and L scales being displaced to suit the conditions of the offset index.

Setting up the limits for the scales is a problem for the individual rule maker. For the rule illustrated (Figure 3) the following limits are selected. (If lower limits are used, then the scales may be made to a larger modulus for the same length of rule with consequent improved readability and accuracy.)

Assume scale C to vary from 0.1 per cent to 50 per cent, and then for A the master scale (by calculation) will of necessity vary from 1389 to 2.8, and for

	B will vary from	999	to 1
similarly,	D	166	to 0.33
	E	120	to 0.24
	F	119	to 0.12
	G	22.2	to 0.044
	H	16	to 0.032

For the scales in the groove,

K	0.008	to 4.17
L	0.063	to 3.13

And for the P scale which appears on the stock, with a multiplier,

P	238	to 0.24

The range of the master scale will then necessarily lie between the largest and smallest values which will be read upon it, i.e., 1389 to 0.032.

The next step is to determine the modulus to which the scales are to be constructed. Obviously the master scale will have the longest range, and hence from the rule that all scales on a slide rule must be constructed to the same modulus, it is only necessary to determine the modulus for the master scale. If the assumption is made that a 1″ modulus be used for every complete logarithmic cycle, i.e., complete logarithmic scale ranging from 1 to 10 or from 10 to 100, etc., then by recourse to a table of common logarithms,

$$1'' \times \text{Log } 1390 = 1'' \times 3.1430 = 3.14''$$
$$1'' \times \text{Log } .032 = 1'' \times \bar{2}.5051 = 1.495''$$

Length of scale = 4.64″

In the case of the rule illustrated, a 14″ blank was available. If a maximum of, say 12″, of the blank is utilized for scales, then the largest modulus which can be used is 12″/4.64″ = 2½ (approx.). The modulus of the A and B scales on a standard 5″ slide rule is 2½ inches, and therefore the scales for this rule might be transferred from the standard rule by means of dividers. If a standard 5″ rule is not available, a variable logarithmic scale may be constructed according to the methods indicated in a paper by the author published in THE PAPER INDUSTRY, January, 1937.

After the C scale and the master scale have been constructed, they may be glued to the rule blank in a fairly central position, on the upper and lower sections of the stock respectively. A piece of white paper is then glued on the slide, and the gauge marks for the various formulae are located by means of trial calculations, after first having located an index arrow on the upper slide to point off the C scale. These gauge points and index should be inked and appropriate symbols added for each for ready identification.

The K and L scales are cut out and glued in the groove under the slide. Where the end of the slide is to act as the index, care must be used to paste these scales precisely where they belong. A simple method is to solve a trial problem before placing the scale in the groove, marking the position of the end of the slide with a sharp pencil, and then gluing the scales into position in such a manner that the value at the pencil mark satisfies the conditions of the trial calculation.

Comment has been made that the scales in the groove are easier to read if the scale is offset, and offset lines are made, connecting the end of the slide with the proper value, as indicated in Figure 2. Some accuracy is lost by this method, and it is believed best to use the end of the slide for the index, fixing the point by eye, and then shifting the slide if the scale is not clearly legible. In many cases however the use of the offset scales might be used.

Figure 3 illustrates this rule, solving the following: When C = 1%, then A = 138.9; B = 99; D = 16.6; E = 11.97; F = 11.85; G = 2.22; H = 1.60; K = .084; L = .625; P = 23600.

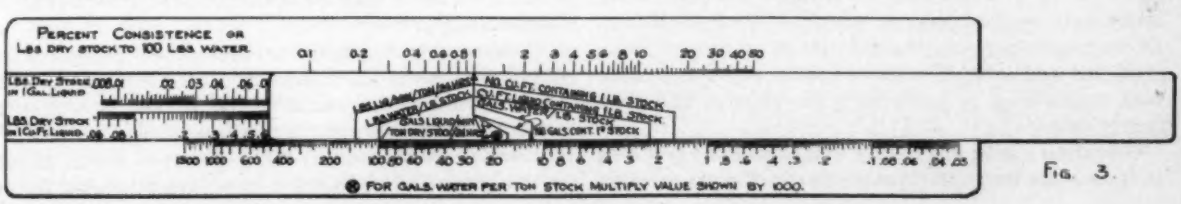

PERCENT CONSISTENCE OR
LBS DRY STOCK TO 100 LBS WATER
0.1 0.2 0.4 0.6 0.8 1 2 3 4 5 6 8 10 20 30 40 50
LBS DRY STOCK IN 1 CU. FT. LIQUID
LBS DRY STOCK IN 1 CU. FT. LIQUID
1500 1000 600 400 200 100 60 40 30 20 10 6 4 3 2 1 .5 .4 .3 .2 .1 .06 .04 .03
FOR GALS. WATER PER TON STOCK MULTIPLY VALUE SHOWN BY 1000.

FIG. 3.

Newer Uses of Glycerine In Paper Manufacture

GEORGIA LEFFINGWELL, Ph.D. and
MILTON A. LESSER, B. Sc.

WITH the steadily increasing emphasis on the production of a wide variety of new types of paper and the growing demand for coated papers for half-tone and color printing, the role of glycerine in the paper field takes on added value.

Examination of the latest literature, with particular reference to patents, shows that the unusual physical and chemical properties of this clear, syrupy, hygroscopic fluid are finding an extensive range of new applications. Aside from its general utilization in coatings and sizings to increase pliability and to prevent shrinkage, glycerine also finds many uses in special and unusual finishes.

For coating paper, one compound calls for a heated mixture of glycerine and starch, which is applied in a gelatinized condition to paper as a plastic layer. A layer of greaseproof material may be applied over this*(1)*. A preparation of acetic acid treated chitin combined with glycerine, starch, dextrose and other substances, finds use as a coating and impregnating composition. The compound is likewise employed in the treatment of rosin sized paper*(2)*. A method for glazing paper consists of coating the surface with a combination of glycerine, phthalic acid, a resin lacquer and a pigment*(3)*.

In the finish of special papers rubber is often incorporated. Here, too, glycerine finds employment. For example, paper is coated with an adhesive, containing rubber solids of an aqueous rubber dispersion, plus other materials. These are mixed with glycerine, which in addition to its other requisite properties, is suitable for this particular need by being non-colloidal. This coating may be vulcanized after application, or vulcanized latex may be used*(4)*.

Laminated paper, the uppermost layer of which has been resin sized, may be treated with a gelatin solution containing glycerine. This treated, hardened layer is given a coating of lacquer and the final product finds use as a washable covering for walls, tables, and the like*(5)*.

When it is desired to give paper or cloth a thermoplastic finish, 0.5 to 10 per cent glycerine is combined with a base containing cellulose acetate. Ordinarily, glycerine is not a solvent for the acetate, but heating combines the two substances*(6)*.

These are but a few of the many finishes in which glycerine is an important constituent. Impregnating is similarly used to produce papers of good flexibility. An impregnating solution consists of sodium silicate, glycerine and soap. The impregnated paper is treated with oxalic acid, to react with the silicate, and then finally dried*(7)*.

Glycerine's lack of toxicity and the safety and ease of its use are important properties in the preparation of water—and grease-proof papers, particularly when associated with the wrapping of food-stuffs. It is not necessary to give many instances of the use of glycerine in this connection since this application is pretty generally known.

Since glycerine, however, enters not only into the preparation of papers which are greaseproof *or* waterproof, but also of papers which are greaseproof *and* waterproof, a few newer methods are of interest. An example of the latter is the impregnation of a highly calendered sulphite paper with glycerine, and then coating the paper with a mixture of albumin, casein, gelatine and other materials. The final product is transparent*(8)*.

Another example of paper particularly suited for wrapping foods, contains dispersed rubber latex, among other ingredients. This is plasticized with glycerine, chosen for its hygroscopic nature. When finished, such a paper is flexible and non-tacky*(9)*. Soft waxed paper from chemical pulp is plasticized with 2.5 to 10 per cent of glycerine*(10)*. Another waxed paper suitable for wrapping foods, contains glycerine in an adhesive vehicle. Such paper may be printed upon with an oil-base ink, and then passed through a wax bath*(11)*.

Paper may be waterproofed by dipping it in a bath containing a solution of colloid, such as gelatine, and glycerine as the plastifier. An insolubilizing agent such as formaldehyde is added either to the bath or to the treated material*(12)*. Regenerated cellulose may be rendered waterproof by treatment with an aqueous emulsion of an oil containing glycerine*(13)*. Paper containing hydrated cellulose is rendered pliable by the incorporation of glycerine during or after manufacture*(14)*.

Glassine paper is plasticized by incorporating a material comprised of glycerine, dextrose and a wetting agent such as sodium nitrate, in a partially dried web of the paper on the dryers. A further amount of the plasticizer is incorporated after the web has been completely dried and during the moistening of the web prior to super-calendering*(15)*. Cerelose and glycerine in aqueous solution are used for treating paper to produce a glassine or imitation parchment paper*(16)*. While on the subject of parchment; a French method of treating this type of paper so as to permit the application of a varnish is interesting. The parchment is treated with a suppling agent such as glycerine which contains a dextrine size. If desired, calcium chloride may be added to the glycerine, as a thickener*(17)*.

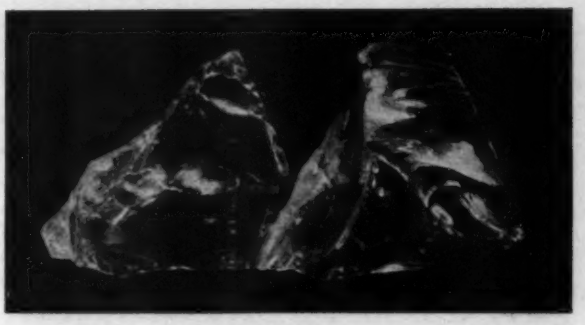
Coming now to the softer, specialized papers, it is found that glycerine takes an interesting part in the compounding and treatment of creped and tissue papers. The following are two typical applications of glycerine. In the manufacture of creped tissue paper with alpha cellulose fibers in open formation, the fibers

may be bonded with a thin film of an albuminous adhesive such as gelatine or glue which contains a large proportion of glycerine as the softening agent*(18)*. Creped paper is strengthened if a web of paper is passed through a bath containing glue, glycerine and rubber latex. As the web emerges from this bath, it is sprayed with a solution containing formaldehyde to form a hardened surface on the web*(19)*.

Certain unusual light papers, some having unique uses, are improved and conditioned by the employment of glycerine. Absorbent pa er for use as a towelling material or the like is given a high wet strength without much loss of absorbtivity by impregnating it with an albuminous adhesive coating containing glycerine*(20)*. The pliability of another type of paper towelling containing a cellulose derivative, may be increased by adding glycerine*(21)*. An absorbent cloth-like paper is prepared by adding viscose to substantially unglazed paper stock at any stage of manufacture. It is then treated with glycerine to render it soft and pliable*(22)*. An interesting absorbent tissue paper, made from spruce pulp which it is suggested can be used for bed sheets, pillow cases and the like, is made strong, supple, soft and absorbent by saturating it, either in a bath or by means of rollers, with a glycerine solution. This solution contains glycerine one part, ethyl alcohol two parts and water three parts. Five and five tenths ounces of talcum powder are added to each six gallons of the fluid. After treatment with the liquid, the paper is passed between wringer rolls and dried*(23)*. A unique cigarette paper and one which is sure to please smokers and non-smokers alike since it prevents smouldering of discarded cigarettes, is prepared by impregnating a zone of the wrapper with a mixture of waterglass (sodium silicate), glycerine, starch and talc*(24)*.

Many valuable, unusual paper specialties take advantage of the properties of glycerine. Strong durable paper is made by placing reinforcing threads, wet with glycerine, between two sheets of paper which are united after treatment with an adhesive such as an ester gum from starch*(25)*. A material particularly suited for separating layers or sheets of tacky materials such as rubber and the like, is made by coating paper with a solution of 140 parts of sodium silicate, 15 parts of glycerine and a small proportion of a wax emulsion*(26)*. A chemically prepared paper for autographic and automatic telegraphy is prepared by soaking in the following solution; ammonium nitrate 2 pounds, potassium ferricyanide ½ ounce, gum tragacanth 2 ounces, glycerine 2 ounces and water ½ gallon*(27)*.

In the preparation of the backing used in the manufacture of decalcomania, specially prepared paper to meet the unique requirements of this industry, glycerine is used as an important constituent. Register is always a problem in the building up of the transferable film. The film may neither contract nor expand, and to aid this, the paper must not change either in length or in width. Here glycerine has an opportunity to display all of its desirable paper characteristics. The paper itself as used by the decalcomania manufacturer, is of a very porous type, similar to fine blotting paper. It is coated with a water soluble coating



Glyptal resin

consisting of glycerine, albumin and starch. This is known as "single" paper. "Double" paper is coated in the same way but is made of a thin paper, backed and strengthened by a heavier sheet of paper which may be readily separated at the time the decalcomania is applied.

Card or paper stock for use in duplicating processes also employs glycerine. A case in point is this patented process: the material is superficially treated with a special, specified glycerine mixture which imparts hygroscopicity to the faces only of the paper or

BIBLIOGRAPHY

(1)—French, A. H. & Gill, L. O., U. S. Pat. 1,985,368, Dec. 25, 1934.
(2)—E. I. DuPont de Nemours & Co., Brit. Pat. 458,813, Dec. 21, 1936.
(3)—Schmidt, E., Ger. Pat. 638,815, Nov. 3, 1936 (Cl. 55f. 15.20).
(4)—Int. Latex Proc. Ltd., Brit. Pat. 425,941, Mar. 25, 1935.
(5)—Bartel, E., Austrian Pat. 147,003, Sept. 25, 1936.
(6)—Schnieder, G., Can. Pat. 367,648, July 27, 1937.
(7)—Crane, F. G., U. S. Pat. 1,889,799, Dec. 13, 1932.
(8)—Wickel, F. K., Brit. Pat. 342,522, Jan. 30, 1930.
(9)—Schopp, J. E., U. S. Pat. 2,021,947, Nov. 26, 1935.
(10)—Dodge, L. L., U. S. Pat. 1,992,996, Mar. 6, 1935.
(11)—Hayward, R. A., U. S. Pat., 2,045,852, June 30, 1936.
(12)—Campora, J., Fr. Pat., 806,901, Dec. 29, 1936.
(13)—Glover, W. A. & Hazeley, E., Brit. Pat. 380,114, Sept. 6, 1932.
(14)—Nelson, H. H. & Becker, G., Brit. Pat., 425,666, May 19, 1935.
(15)—Dozier, L., U. S. Pat., 2,058,961, Oct. 27, 1936.
(16)—Bidwell, G. L., U. S. Pat., 1,914,798, June 20, 1933.
(17)—Champsaur, L. M., Fr. Pat. 47,016, Nov. 30, 1936.
(18)—Asnes, B., U. S. Pat. 2,046,763, July 7, 1936.
(19)—Arpin, Jr., E. P., U. S. Pat. 1,913,017, June 6, 1933.
(20)—Brown Co., Brit. Pat. 441,347, Jan. 17, 1936.
(21)—Richter, P. O., Brit. Pat. 423,471, 1935.
(22)—Richter, G. A. & Schur, M. O., U. S. Pat. 2,048,293, July 21, 1936.
(23)—Hoffman, G. C. & deBourgogne, H., Brit. Pat. 452,352, Aug. 20, 1936.
(24)—Ruben, H. & Solomonski, M., U. S. Pat. 2,049,320, July 28, 1936.
(25)—Humphner, F. W., U. S. Pat., 2,076,343, Apr. 6, 1937.
(26)—Thompson, H. L., U. S. Pat. 2,017,499, Oct. 15, 1935.
(27)—Hopkins, A. A., *Sci. Am. Ency. of Formulas*, Munn & Co., N. Y. C., p. 923.
(28)—Jones, R. S., U. S. Pat. 2,021,938, Nov. 26, 1935.
(29)—Ellis, C., U. S. Pat., 2,078,239, Apr. 17, 1937.
(30)—Ellis, C., U. S. Pat. 1,892,939, Jan. 3, 1933.
(31)—Ellis, C., U. S. Pat. 2,086,903, July 13, 1937.
(32)—Bradley, T. F., U. S. Pat., 1,896,215, Feb. 7, 1933.
(33)—Mantle Lamp Co. of Amer., Ger. Pat. 640,714, Jan. 11, 1937 (Cl. 55f. 16).
(34)—Zanker, W., Fr. Pat. 806,805, Dec. 26, 1936.

card*(28)*. The printing qualities of glycerine treated stock is usually of a high order. Nor should it be forgotten that most lithographing and many printing inks contain glycerine. Within the last decade the importance of the synthetic resins has manifested itself in the myriad applications they have achieved. The paper industry, too, has benefited from these advances. New effects, new finishes, new products with new uses, have been made available. In this growing world of synthetic resins, glycerine, too, has kept pace through the now familiar "glyptal" resins. These glyptal resins have made possible new strong, tough papers, with dull or glossy, flexible or stiff finishes that may be opaque, translucent or clear, with a resistance to many solvents and oils. These properties can be controlled to meet almost any specifications. Basically, glyptal resins are condensation products of glycerine and phthalic acid or anhydride. The straight resin is a clear, hard, pale yellow substance with fine gloss. These properties are modified however, by the addition of one or more substances, the type and amount of addition depending upon the properties needed. These straight or modified glyptal resins may be included in the paper during manufacture or may be impregnated into, or coated upon it. Many of them are compatible with other resins, both synthetic and natural. A few illustrative examples are given from the recent patent literature. Glycerine and phthalic anhydride are combined with hydroxybutyric acid and vegetable oil fatty acids. These are heated together to about 260 deg. to 300 deg. and yield products which may be combined with nitrocellulose to form a coating compound for paper and other materials *(29)*. A similar combination of a glyptal resin and nitrocellulose, prepared by the same investigator, is particularly recommended as a greaseproof coating for paper*(30)*. Another compound, likewise patented by Ellis, consists of a glyptal resin modified with a higher fatty acid in chemical combination. This it is claimed is suitable for wrapping foods, especially oily ones*(31)*. Others have patented similar grease-repellent papers*(32)*.

An interesting transparent heat and lightproof paper is made by impregnating unsized paper with a fused mass containing alpha cellulose and a light and heat resisting resin of the glycerine-phthalic acid type. The product is subjected to polymerization by heat. Such papers are suitable for lamp shades and the like*(33)*. Another unusual paper, used for the protection of bank notes and similar valuable documents, uses a glyptal resin in the process of preparation; rayon is treated with fluorescent dyes by a given procedure. The rayon is then fixed with an acetone solution of the condensation product of glycerine and phthalic acid (glyptal resin), cut up into small pieces or ground to a powder. This product is added to the paper pulp. The fixed fluorescent dyes are the means of identifying the valuable, treated papers*(34)*.

These are but a few of the myriad uses for glyptal resins made with glycerine. The employment of glycerine in general by the paper industry has merely been indicated in this review. That these are not of a theoretical nature but of a preeminently practical nature is shown by the fact that the patent literature gives so many of them. There are numerous other applications that are in use. Many other potential uses for glycerine will suggest themselves to paper technologists as it is realized that this versatile fluid has a wide range of suitableness in many types of procedures.

Graphited Paper Stock

BERNARD H. PORTER

DESIRABLE properties of lubricity, opacity, non-fading coloring and conductivity have recently been imparted to paper stock by coating or impregnating it with dispersions of graphite. This work has been prompted somewhat by the commercial use of graphited papers abroad.

Of the carbonaceous materials that might be used for such purposes, the colloidal variety, i.e., the electric-furnace product having sufficient fineness to permit suspension in liquids, is most adaptable. Such a product is obtainable in mineral and castor oils, glycerine, and water. The aqueous form, however, in the concentrated state is most conveniently used as it can be added directly to the beaters as the pulp is masticated.

If the present trends of competitive industries are to incorporate additional properties into basic materials by impregnating and processing with other bodies, thereby widening the scope of general application, the graphite treatment of paper should hold special interest. The term "colloidal" denotes the fine state of the graphite's subdivision. A dispersion of this porduct in distilled water will pass through a filter paper, while a graphite suspension in oil has proven itself an effective photographing opaque for the breathing tubes of mosquitoes. Such fineness is obviously essential for impregnation techniques. Ordinary and finely powdered graphite would be too coarse.

When diffused throughout paper, graphite is an efficient dry lubricant. Besides lubricating in the absence of undesired oil products, colloidal graphite is chemically inert. Being insoluble in acids and alkalies, it does not combine in objectionable chemical reactions either with the paper, and its agents, or with bodies later coming in contact with the treated specimens. Graphite, having a resistance to oxidation that is proportional to its temperature of formation (3000 deg. C.), will withstand heat far in excess of paper's ignition point.

Graphited stocks are grey-black in color, the shade of the dried films tending to the grey. When incorporated in paper, the color is retained to advantage and is resistant to fading and other changes. Being a "black body," carbonaceous substances impart this

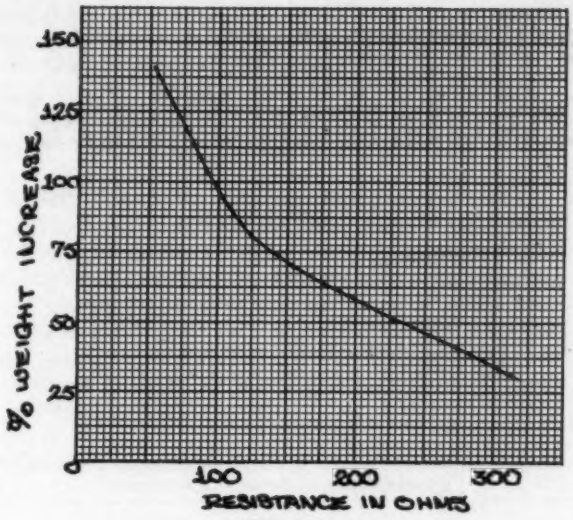


Figure 1

property to paper and render it capable of both radiating and absorbing heat. Useful reflecting, opaque and dyeing properties are also attained.

For example, an opaque but thin white paper, highly desirable in the publication of bibles, encyclopedias, and other thick volumes, is produced readily by adding colloidal graphite to the beaters when the paper is formed. Owing to the dulling effect of black graphite on the color, obviously only very small amounts are used in obtaining the desired opacity. For the same reason, this treatment applies mainly to low-colored papers, and may not increase opacity in very bright colored rag and wood papers.

Similarly, non-fading features are obtained for printing stocks used in those advertising displays subject to direct sunlight. Only small quantities of colloidal graphite in aqueous dispersion are necessary in obtaining this quality.

Films formed with graphite in water are electrically conductive, a characteristic that is useful in paper stock for the new automatic recording and duplicating machines. In an ingenious method of printing, both the ink and paper must possess some degree of conductivity.

When the dried graphite deposits can be polished, the resistance is decreased as the particles are forced into closer contact and more even alignment with one another. Paper impregnated with graphite for conduction purposes should be kept dry at all times to maintain stable electrical characteristics. A curve relation of resistance in ohms per inch length per inch width against percent increase of a paper's weight due to the addition of graphite is shown in Figure 1.

Finally, decorative papers of an interesting sort have been made by applying an aqueous paste of concentrated colloidal graphite to stock with a camel's-hair brush. Figure 2 illustrates the variegated effects that are produced for book covers by random rendering. After the surface is dried, the graphite films may be left in their grey-black finish or may be polished highly to a lustrous black shade. Where the job does not permit of such hand work, as is usually the case, reproduction from the artist's original and later printing with the plate is accomplished in the customary manner.

Paper surfaces are treated readily by spraying, painting, or dipping. Unheated and agglomerate-free dispersions of colloidal graphite are used. Prolonged immersion in warmed solutions is at times helpful. As already suggested, the preferable procedure is the addition of graphite to paper in the wet and formative state. In this case, electrolytes like zinc chloride ($ZnCl_2$) or aluminum sulphate (alum) are added subsequently to the mix to affix the colloidal graphite to the pulp fibres.

Factors usually encountered in impregnation techniques include the electrical surface charge of the paper and the presence of moisture or occluded air in the interstices of the material. Should the sign of the paper's charge be opposite to that of the impregnating particles, neutralization may result, causing absorption on the outer portion of the paper. Particles so absorbed clog the pores and serve as ultra-filters. Hence this condition prevents penetration of additional impregnant.

Drying the stock, however, eliminates these obstacles. This should be done before impregnation is attempted. Although low temperatures dissipate the electrical charges, higher heat treatment is required over a period of time to exclude moisture and air. The temperatures, obviously, are kept below the

Figure 2

ignition point of the paper and are more severe for heavy stock than is the case for lightweight grades. The weights of paper used in printing and advertising do not require the use of more rigorous impregnating devices, like centrifugal machines or evacuating filter systems.

This data, describing properties imparted to paper by treatment with colloidal graphite, offer suggestions for new products of interest to the paper trade.

Low Temperature Drying of Cornstalk Insulating Board*

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IN the manufacture of insulating boards the drying, from the standpoint of cost, is one of the most important operations. Because of the thickness and lack of flexibility, it is not practical to dry the board on drying rolls such as are commonly used for paper. The common type of dryer is a tunnel dryer through which the boards are conveyed upon rollers. An alternative method is to dry in a hydraulic press using spacers to regulate the thickness of the finished board. Either method involves equipment which is high in first cost and relatively expensive in operation.

If it were possible to dry boards in rooms at customary room temperatures in piles somewhat as lumber is dried, there is a possibility of reducing drying costs because of the use of simpler, cheaper equipment

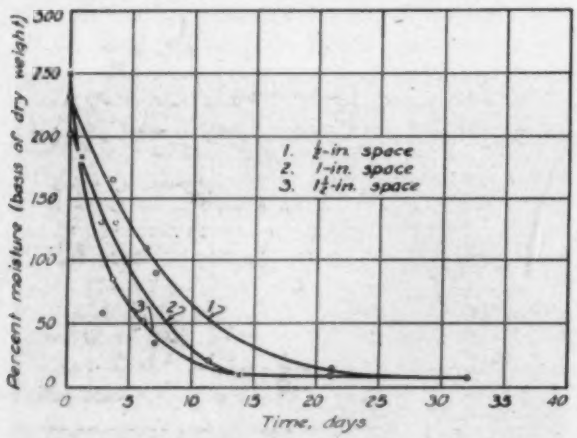


Fig. 1—Relation of moisture and time for boards dried with different spacings—average values

and possibly lower heat costs. Another possibility would be to dry under sheds at out-of-doors temperature. To determine something of the feasibility of drying under these conditions a series of experiments were carried out.

In the preliminary experiments the mats of board as they came from the forming machine with about 70 per cent moisture were stacked in small piles on horizontal wooden platforms with narrow strips of dry one-half inch insulating board between them. Under these conditions the top boards dried quite rapidly. The other boards dried very slowly apparently because of the poor circulation of air between them.

To secure more rapid air circulation the horizontal platforms were replaced by platforms with tops slanting at a 20-degree angle from the horizontal. Ten or eleven boards were piled on each slanting platform, being separated by three one inch wide strips of insulating board between each two boards. These strips were spaced equally across the boards running the long way, that is, up and down the slant. This arrangement allowed the light weight water vapor to rise up along the boards and be replaced by drier air from below. To determine the effect of various spacings between the boards, three series of boards were dried with spacings of ½ inch, 1 inch, and 1½ inch, respectively. The boards used were made from mechanical cornstalk pulp containing 20 per cent paper and pressed at 75 pounds per square inch (cold) in a hydraulic press. Each board was weighed when it was placed upon the pile and then at intervals of two or three days until no further decrease in weight oc-

Table 1.—Effect of Various Spacings on Moisture Contents of Boards Drying at Room Temperature*

No. 1†	Moisture, percent (dry basis), after number of days noted below							
	0	3	4	6	7	11	21	33
Spacing, ½ in.								
1	243	125	100	62	42	23	12.8	7.2
2	230	182	164	148	126	85	13.5	6.4
3	244	176	166	146	128	95	16.2	6.5
4	248	173	162	134	114	77	14.1	7.4
5	239	169	148	129	108	67	12.9	7.1
6	242	172	156	131	111	63	12.2	6.4
7	241	178	101	130	109	67	10.3	7.0
8	220	156	140	104	88	48	11.4	7.3
9	231	154	131	101	89	44	11.0	6.7
10	231	154	126	86	62	23	10.1	6.7
11	224	73	46	18	13	13	9.5	7.7
Average	237	166	131	108	90	55	12.0	6.9
Spacing, 1 in.								
12	209	125	94	64	45	27	12.1	8.6
13	216	127	89	61	41	18	9.3	7.4
14	207	123	94	60	41	21	7.3	5.9
15	212	128	102	68	46	15	8.1	5.3
16	201	125	87	50	31	14	8.1	6.2
17	150	126	93	52	34	15	9.9	6.3
18	165	131	102	67	47	15	9.8	8.0
19	220	137	105	67	42	15	8.8	7.3
20	191	137	104	55	34	14	10.6	7.5
21	208	116	80	33	18	13	10.1	7.1
22	212	60	32	13	13	11	10.6	7.1
Average	205	130	89	54	36	16	9.5	7.0
Spacing, 1½ in.								
No.	Moisture, percent, after number of days noted below							
	0	1	4	14	25			
23	228	175	83	13	8.1			
24	231	198	92	12	7.8			
25	250	186	87	12	6.9			
26	252	189	90	12	8.1			
27	266	187	64	13	7.6			
28	249	178	58	12	7.2			
29	247	171	48	10	7.3			
30	244	167	41	12	7.3			
31	252	170	40	11	7.2			
32	256	129	15	10	7.9			
Average	250	175	62	12	7.5			

*The pulp was mechanical, with 18 percent paper; refined in rod mill and Bauer fibrator.

†Numbering is from bottom upward; that is, Nos. 1, 12, and 23 are bottom boards of the three piles with different spacings.

(*) The work reported in this paper is a part of the regular Station project on the production of insulating board from cornstalks.

curred. The boards were finally dried to constant weight in the regular board dryer. The moisture content of each board at each weighing was then calculated as a percentage of the dry weight of the board. An examination of the data (Table 1) shows that during the first part of the drying period the rate of dry-

Table 2.—Relation of Moisture and Time of Drying (Low Temperature)

No.	Moisture, percent (dry basis)					
	Original	1 day	2 days	3 days	4 days	5 days
A 2	250	85	25	9.0	8.8	—
4	250	90	33	7.0	7.1	—
6	250	105	38	6.0	6.1	—
8	248	100	34	7.0	7.1	—
10	240	77	21	6.0	6.1	—
B 1	253	94	28	8.0	9.6	—
3	254	105	39	7.0	7.8	—
5	255	101	35	7.0	8.2	—
7	255	104	36	7.0	7.8	—
9	254	93	29	5.0	6.1	—
C 1	245	112	33	—	—	—
3	234	121	45	4.0	4.4	—
5	248	129	52	8.0	8.6	—
7	251	117	37	9.0	9.7	—
9	248	107	30	8.0	7.2	—
D 1	252	129	49	8.0	9.4	—
3	238	125	52	9.0	10.4	—
5	254	129	49	8.0	9.8	—
7	247	130	44	4.5	4.0	—
9	278	186	—	9.6	4.2	7.6
E 2	280	168	—	7.2	6.0	5.9
4	279	179	—	8.0	5.0	5.9
6	286	186	—	15.9	10.7	10.8
8	285	179	—	6.8	4.3	8.5
10	278	162	—	5.5	4.0	7.0
F 1	282	171	—	5.8	4.2	8.1
3	281	183	—	8.3	2.9	10.6
5	278	182	—	8.0	3.9	7.0
7	278	185	—	9.8	4.8	7.2
9	278	174	—	6.6	4.7	6.7
G 3	282	153	—	8.8	6.2	7.9
5	276	187	—	10.3	4.4	6.6
7	278	183	—	8.6	5.0	6.8
9	279	173	—	6.4	4.8	7.4
11	286	187	—	9.8	5.6	8.2

ing was greater for the boards spaced 1½ inches apart than those spaced 1 inch apart. There was an even greater difference in drying rate between the boards spaced ½ inch and 1 inch apart. This same general relation is shown both in average values (Figure 1) and those from boards on the interior of the pile (Figure 2). Within two weeks the boards spaced 1 inch and 1½ inches apart had dried to 10 per cent moisture. Three weeks were required for the same amount

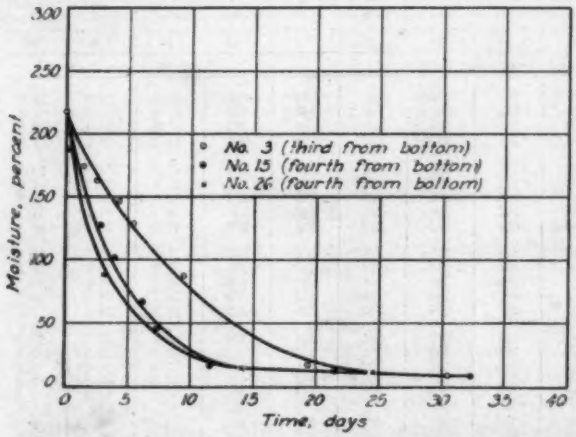


Fig. 2—Relation of moisture and time for boards dried with different spacings—boards from within the piles

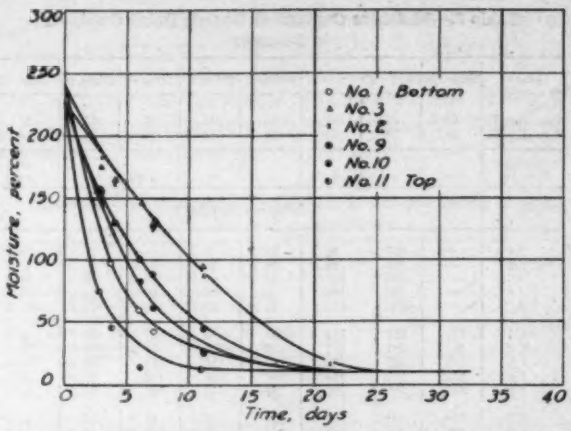


Fig. 3—Relation of moisture and time for boards in different positions in pile—½ inch spacing

of drying to occur with the ½ inch spacing. The top and bottom boards in the pile with the ½ inch spacing dried more rapidly than those on the interior of the pile as shown in Figure 3.

When piled with spacing strips, the wet boards sagged between the strips. The strips also covered part of the board preventing access of the air to all of the surface. To remedy this, frames and racks for holding the boards while drying were constructed.

Fig. 4—Boards on frames of wire netting in rack

The frames were made of 1 inch wooden strips 1¾ inches wide with outside dimensions 30 by 36 inches. One inch mesh poultry netting was fastened to one side. The frames were held in racks (Figure 4) three inches apart at a 30-degree angle. Another set of frames was made of wooden slats (Figure 5) set on

Table 3.—Moisture Content of Boards Dried Outdoors in Summer

Date	May 29	May 30	June 1	June 3	June 4	June 6	June 8	June 10
Temp. Max., deg. F.	81	86	81	66	74	75	83	67
Min., deg. F.	55	54	61	44	44	54	55	48
Precipitation, in.	—	—	0.71	—	—	0.39	—	—
No.	Moisture, percent*							
A1	—	317	40.8	16.3	8.8	—	12.8	8.8
A4	—	205	99.2	56.4	45.0	25.0	16.4	16.4
A5	—	190	102	63.9	43.2	31.5	16.8	16.8
A6	—	245	119	80.0	58.5	33.6	22.9	19.3
A7	—	222	115	77.3	53.5	29.2	15.3	15.3
C1	317	281	162	105	79.0	47.0	23.8	13.7
C2	295	281	171	129	109	77.0	56.6	39.5
C3	319	297	202	162	146	113	80.8	61.6
C4	325	297	193	159	137	105	82.0	62.2
C5	327	302	193	150	138	105	77.8	53.5
C6	259	245	151	135	102.8	81.0	56.8	40.0
C7	295	254	153	124	97.4	75.7	54.3	25.0
C8	311	293	161	114	99.0	74.0	48.8	23.7
C9	273	257	142	97.0	65.0	42.5	23.8	14.4
C10	382	304	68.0	19.0	15.2	11.1	11.1	15.2

*Based on an equilibrium value of 5 percent, but on dry basis.

edge with spacers between and held together by steel rods passing through at right angles to the flat surfaces of the slats. These frames were held in the same type of racks as the others.

Boards from steamed cornstalk pulp containing 20 per cent repulped newsprint dried on the frames in as short a time as 3 days (Table 2 and Figure 6). The humidity at the time of drying was not determined but was known to be very low since the room was heated to about 70 deg. Fahr. but not air conditioned and the outside temperature was very low. Most of the boards actually absorbed moisture on the fourth day when the air apparently became more moist. Boards dried upon the wooden slat frames at practically the same rate as upon the wire covered frames.

The preceding results were all secured in a heated room during the winter months when the humidity was very low. To determine how the drying would proceed at out-of-door temperatures and humidity, boards were dried on racks in an unheated building open to the outside air but protected from precipitation. Even during the summer in periods of very little precipitation, drying under these conditions was much slower than in the heated building. Boards from steamed cornstalk pulp containing 18 percent repulped newspapers dried in 12 days from May 29 to June 10, to a moisture content of 8.8 per cent (Table 3). Weights secured after June 10 showed that equilibrium conditions had been reached. The moisture data given were arbitrarily calculated on a basis of 5 per cent moisture remaining in the boards. The ab-

Fig. 5—Boards on frames with wooden slats

Table 4.—Moisture Content of Boards Dried at Low Temperatures

Date	Dec. 23	Dec. 24	Dec. 30	Jan. 2	Jan. 3	Jan. 6	Jan. 7	Jan. 9	Jan. 13	Jan. 16	Jan. 17	Feb. 7	Mar. 2	May 20	May 22
Temperature, Max. deg. F.	—	—	—	34	34	24	14	28	24	22	19	12	39	82	90
Min.	—	—	—	30	29	14	3	14	0	8	6	—6	31	55	64
Precipitation, in.	—	—	—	0.21	0.02	0.02	T	—	—	0.28	0.15	—	—	—	—
Days of drying	—	0	6	9	10	13	14	16	20	23	24	45	69	148	149
No.	Moisture, percent (dry basis)														
A4	—	315	300	308	308	292	284	292	276	272	260	264	32.0	24.0	12.0
A5	—	300	293	296	300	283	280	283	269	262	259	259	34.5	20.7	6.9
A6	—	355	340	345	350	325	320	325	310	300	290	295	45.0	30.0	10.0
A7	—	302	300	302	302	289	278	281	267	267	259	259	40.7	25.9	7.4
B1	—	313	304	304	300	288	279	279	254	246	246	225	45.8	33.3	16.6
B2	—	292	282	292	289	274	271	271	256	252	245	237	33.3	22.2	7.4
B3	—	317	317	317	317	300	292	300	279	275	275	258	33.3	28.3	8.3
B4	—	304	296	294	300	281	274	285	267	262	256	248	29.6	22.2	11.1
B5	—	333	329	329	329	313	304	302	292	292	288	275	41.6	29.2	16.6
B6	—	313	307	313	313	293	286	293	278	275	272	275	35.6	25.0	10.7
B7	—	270	266	266	266	254	251	254	238	238	235	226	22.2	12.7	3.2
B8	—	308	304	298	300	286	278	286	268	264	260	250	32.2	25.0	10.7
B9	—	307	307	304	305	290	278	282	238	239	234	250	35.7	23.2	10.7
B10	—	290	290	278	282	264	257	257	236	232	228	218	35.7	21.4	7.1
C1	360	374	355	362	362	339	331	335	312	304	298	276	45.0	37.2	17.5
C2	338	317	307	310	317	294	296	290	283	276	276	264	24.3	20.9	6.9
C3	360	360	348	356	360	332	338	344	324	320	320	296	36.0	28.0	8.0
C4	348	331	328	328	324	300	304	307	297	290	290	268	31.0	20.7	3.4
C5	330	306	301	303	306	285	288	290	270	271	271	278	25.8	19.4	3.2
C6	339	319	316	326	316	294	297	300	290	284	280	265	29.0	16.1	3.2
C7	355	332	329	332	332	310	310	316	300	297	297	281	35.5	22.6	6.5
C8	353	327	327	334	334	307	310	314	300	297	294	276	33.4	21.7	6.7
C9	364	343	340	343	356	317	320	324	310	310	304	284	46.6	23.4	6.7
C10	360	338	334	334	338	307	310	310	293	287	287	266	46.6	26.6	10.0

normally high temperature and low humidity during the latter part of the drying would make any error in this assumption small.

Boards were also dried in the unheated building under winter conditions. When the temperature was below freezing the drying was very slow. Drying data

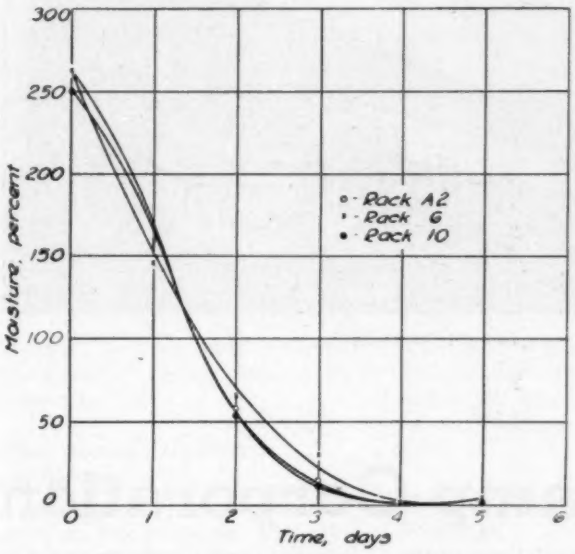


Fig. 6—Relation of time and moisture for boards on wire netting covered frames

and corresponding weather data are given in Table 4 and Figure 7.

To determine whether drying in the usual dryer and drying in the racks out in the room produced boards of different strength, a run of board was divided into two parts and dried by both methods. Tests on the boards indicated that there was no sig-

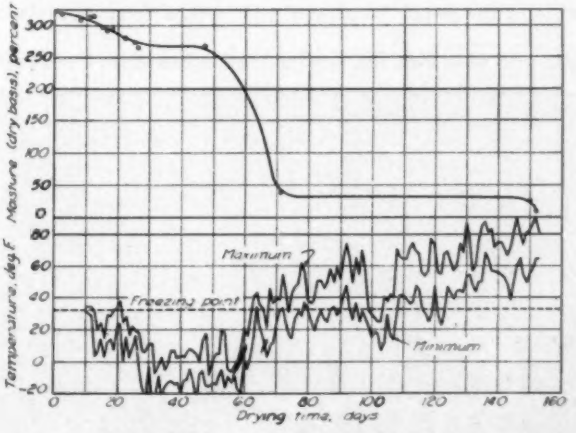


Fig. 7—Time-Moisture relations for boards dried outside in winter

nificant difference in strength or moisture absorption (Table 5). It was noted that boards dried on the racks in the heated building warped somewhat while those dried in regular board dryer or in the unheated building did not. This was no doubt caused by the low humidity in the heated building.

The results indicate that cornstalk insulating boards will dry at ordinary room temperature in as short a time as four days if the humidity is sufficiently low. Some warping occurs under these conditions. Drying at summer temperatures and humidities (Iowa climate) is considerably slower, requiring about two weeks. Practically no drying occurs below freezing

Table 5.—Comparative Strengths of Boards Dried in Open Air and in the Drier

Quantity	Air dried	Drier dried
Number of boards averaged	3	10
Modulus of rupture, lb. per sq. in.	397	344
Thickness, in.	9/16	9/16
Weight, lb. per 1,000 sq. ft. ½ in. thick	770	763
Moisture absorption in ½ hr., percent	11.70	11.74

so that out-of door drying in the winter is not practical. The best results were secured by drying the boards on wire covered frames set at 30-degree angle from the horizontal and with a 3 inch space between each two frames.

◆ ◆ ◆

Paper Wrapping for Air Transportation of Cut Flowers

CUT flowers can be grown in California, shipped across the continent by air express, and arrive in near perfect condition as a result of a new paper wrapping process devised by government experts.

First the flowers are placed in an ordinary shipping box which is wrapped with waxed paper, and then wrapped again with about thirty thicknesses of water-soaked newspaper. Another waxed paper wrapping is placed around the wet paper to retain the moisture. The package is then placed in a common pasteboard box, which is wrapped with fifteen thicknesses of dry newspaper and one thickness of heavy wrapping paper.

In the cold, rarefied atmosphere, the water-soaked paper starts freezing. Heat released by the freezing of the water slowly penetrates the inside of the package, and is retained by the outside wrapping and insulation of dry newspapers. Protected by this method, flowers keep fresh longer than the time usually required for a plane to reach New York from San Francisco.

◆ FOREST FIRES throughout the United States during 1936 totalled 226,285 and caused damage estimated at $54,000,000. Of the 43,206,000 acres of burned land, 38,990,000 acres were on unprotected forest areas, which is almost one-fifth of all unprotected forest land, and 2,292,000 acres more than the previous five year average. The remaining 4,216,000 acres of land which was burned represents less than one per cent of the total protected forest acreage and only 2,936,000 acres were recorded as productive. The value of damage, however, amounting to $14,066,000 is an increase of $3,743,000 over the average of the preceding five years. The proportionate value of this damage to federal lands was $1,685,000, while state and private forest holdings accounted for the balance of $12,381,000. (From *Manufacturers Record*)

View of mill with machine room in right foreground

New Mill of the Chesapeake-Camp Corporation

WITH the completion of the new kraft paper and board mill of the Chesapeake-Camp Corporation at Franklin, Virginia, an additional unit has been added to the growing southern paper industry.

Engineering and Construction

The entire construction job was carried out by the Rust Engineering Company of Pittsburgh. This organization also had charge of the purchase and installation of all equipment. The design was in the hands of J. E. Sirrine & Company of Greenville, S. C.

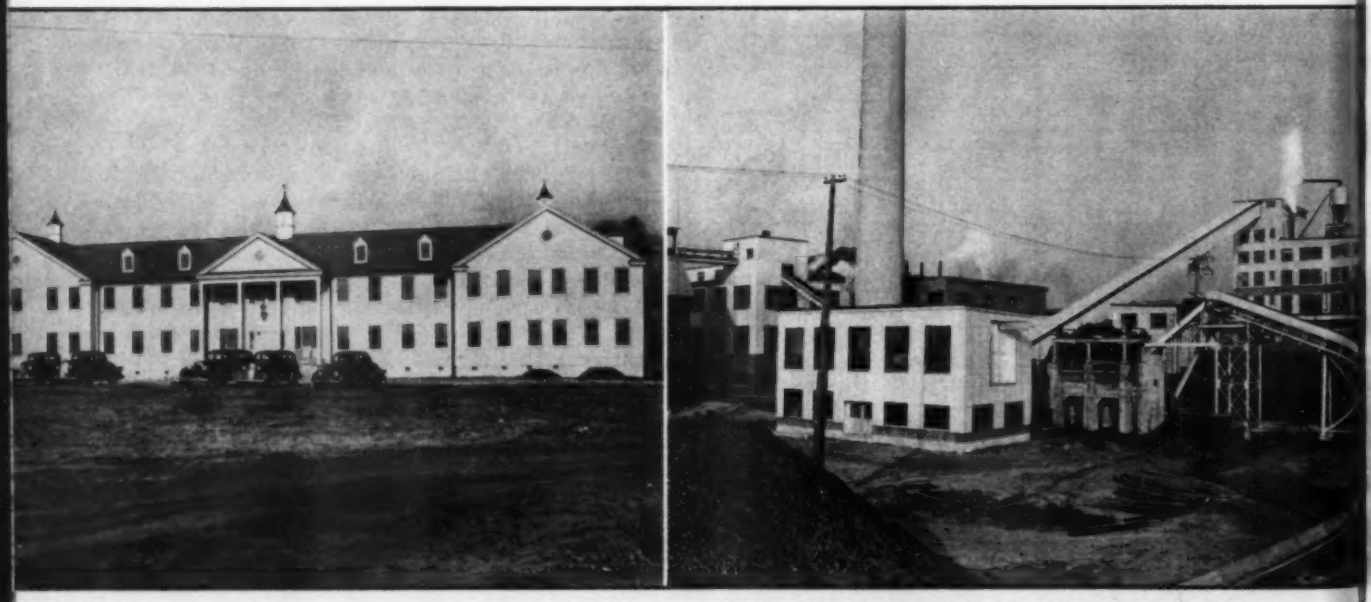
Plant Ownership

Chesapeake-Camp Corporation, which was formed to own and operate the new plant, represents a union of two organizations, one of which has been active in the paper industry for the past twenty years, and the other of which has extensive lumber operations. Ownership of the common stock is divided between the Camp Manufacturing Company of Franklin, Virginia, and the Chesapeake Corporation of West Point, Virginia.

Major Factor in Site Selection

The existence of a large supply of saw mill refuse from the plant

New colonial style office building (left), and general view of mill with wood room and barking drum in immediate foreground



of the Camp Manufacturing Company was a major consideration in selecting the site of the new paper mill. From 400 to 425 tons of green refuse per day, in addition to about 50 tons of kiln-dried refuse, are available. This naturally suggested the use of this enormous quantity of material to supply the fuel requirements of a power plant for both the new paper mill and the saw mill. Accordingly, the kraft plant was built adjoining the mill, and an extensive conveyor system was installed to handle the fuel.

A study of the supply of pulpwood in the vicinity indicates that with proper cutting the plant will be able to draw upon adequate quantities of timber for an indefinite period.

Wood Storage, Handling and Barking

Ample storage space has been provided for pulpwood adjoining the plant, and the most modern facilities have been designed for its handling. Typical of this equipment is a new type of grapple, which has been provided for the crane which transfers logs from cars to storage or from storage to the log conveyor. This grapple can pick up a load with an area of 16 square feet in lifting five-foot logs. Sufficient closing power is provided to insure full loads even when handling logs 18 feet in length and with diameters of 12 to 14 inches.

Logs are taken to the barking drum by two chain conveyors with a capacity of 30 cords per hour. The barking drum is of the wet type. It is built of special hot rolled U-bars and is suspended in heavy six-inch pitch alloy-steel chains. It has a capacity of 15 cords per hour and is 10 feet in diameter and 30 feet long. Power is supplied by a 75 horsepower 720 r.p.m. motor.

Chipping, Screening and Crushing

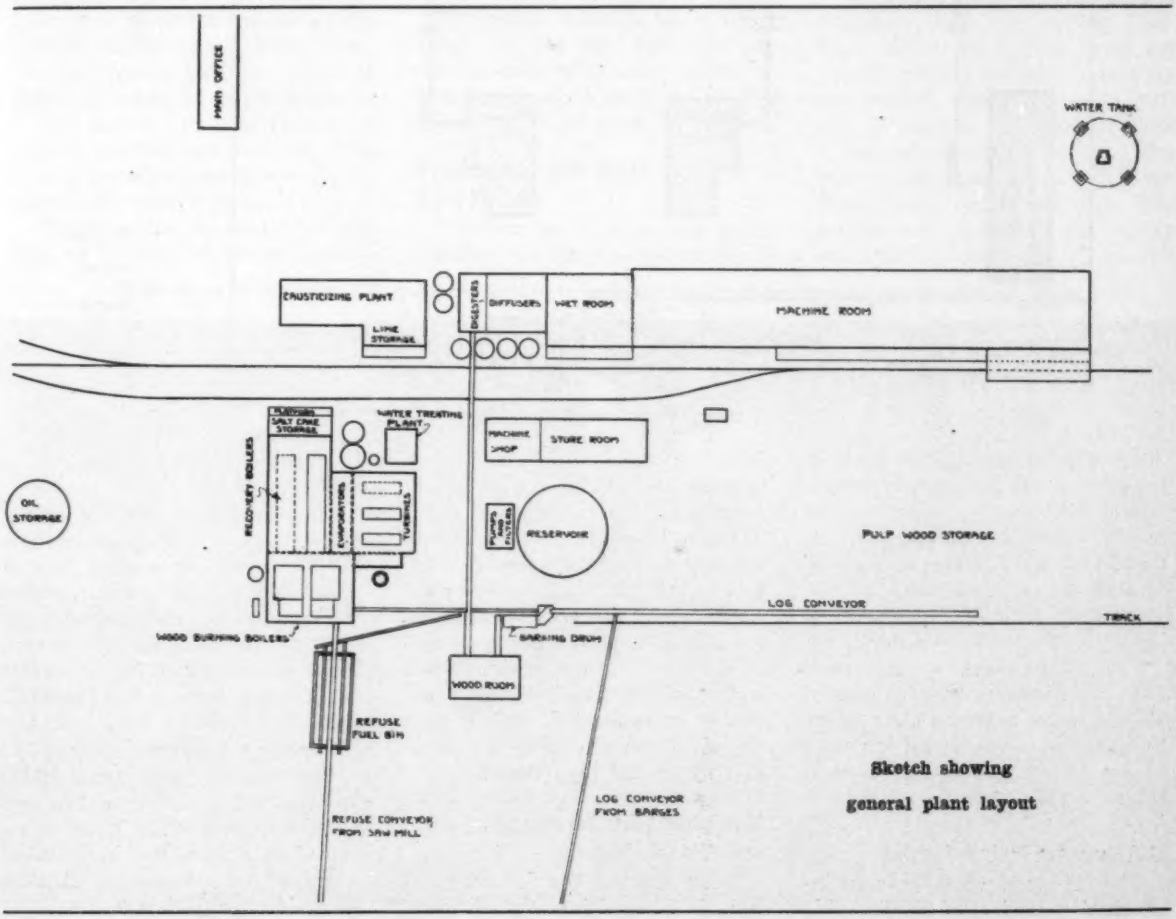
A chain conveyor carries the logs to an 88-inch chipper in the adjoining wood room. This chipper is equipped with roller bearings and is directly connected to a 250 horsepower synchronous motor. A gyrating screen with two screen plates, each 5 feet by 10 feet and with a capacity of 13 to 15 cords per hour receives the chips from the chipper. This screen is driven by a five horsepower 1200 r.p.m. motor.

A 35-inch swing hammer crusher, with anti-friction bearings directly connected to a 25 horsepower 1200 r.p.m. motor, crushes the oversize chips. The fines are carried by a conveyor to the fuel conveyor leading to the boiler house, and the accepted chips are moved on a belt conveyor to chip storage above the digesters.

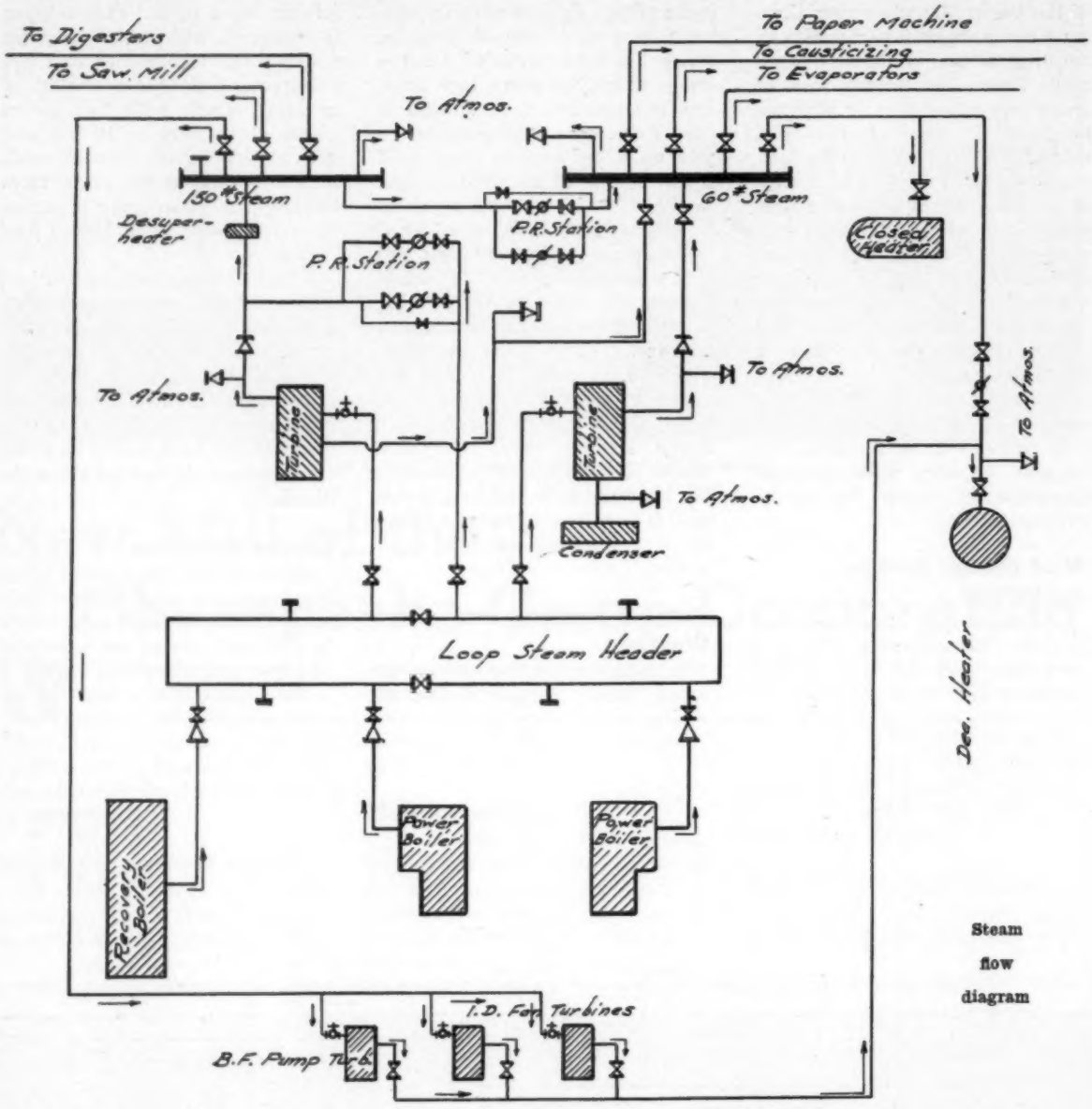
Digester Installation

After reaching the digester building, the movement of material from chips to finished paper is as nearly in a straight line as the intricacies of paper manufacturing permit.

The digesters, of which there are



Sketch showing general plant layout



Steam flow diagram

three, were designed for a working pressure of 150 pounds per square inch. Individually, they are 10 feet 6 inches in diameter by 30 feet 7 inches high; have a capacity of 3,050 cubic feet; and are of welded construction, all welds being X-rayed to detect possible flaws.

The cooked stock is discharged from the digesters through 8-inch, seatless motor-operated blow valves to a cyclone, from which it passes to one of six diffusers through a rotary spout.

Diffusers for Pulp Washing

The diffusers, which have an individual capacity of 3,600 cubic feet, are made of 5/8 inch steel plate and are equipped with motor-operated dump valves.

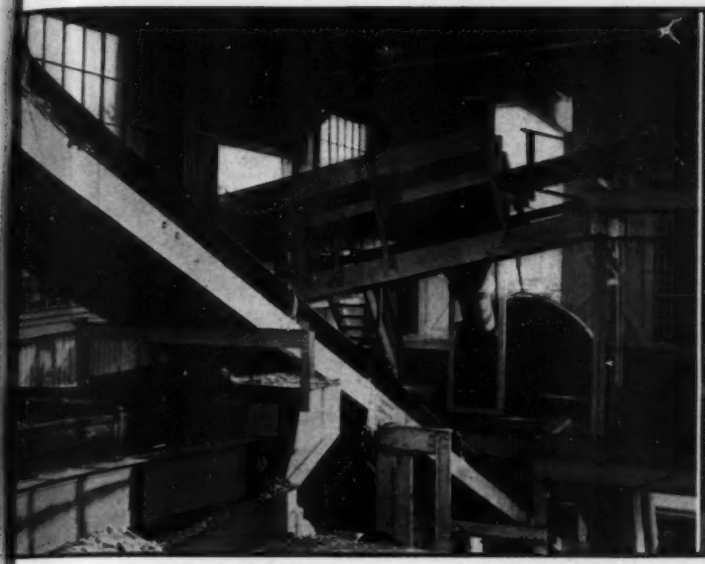
Vapor from the main cyclone is led to a dummy cyclone and thence to a blow-down water heater. Non-condensible gases are discharged to the atmosphere, and dirty condensate is sent to the sewer. Wash water is circulated through the heater to be heated, and is then stored in one of two 18-feet diameter by 18-feet high tanks.

Equipment for Screening and Thickening

After leaving the diffusers, the pulp is dumped into a stock chest, from which it is pumped to a knotter-head box.

The equipment for the subsequent treatment of pulp includes two knotters, four screens (one of which is a tailings screen), and a thickener. After going through the knotters, the rejected pulp is sent to a thickener and from there to two refiners, then to a refined tailings chest, tailings head box, and to the tailings screen.

The accepted pulp goes from the knotters to three screens. The previously rejected pulp and the accepted pulp are united in the thickener head box. A save-all is located alongside the thickener.



Left—Wood room view showing chipper, chip screen, and two conveyors. Right—View from bottom of digesters

Stock Treating Equipment

After thickening, the material passes to a battery of five roller bearing equipped jordans. Each of these units is driven by a 400 horsepower direct-connected 400 r.p.m. synchronous motor. Arrangements have been made for the use of the jordans in various combinations, in accordance with the type of paper or board being produced.

Two double propeller type pulp mixers, likewise, are installed. The double propellers are driven by 7½ horsepower gear type motors.

Provision also is made for wet lapping of pulp for storage or sale, and a broke beater is installed for the reconversion of trim and other waste paper to pulp. A beater for wet lap and a beater for newsprint are provided.

Speed and Size of Paper Machine

The paper machine has a speed range of 150 to 1,200 feet per minute and will make paper or board at a maximum width of 210 inches before allowing for trim.

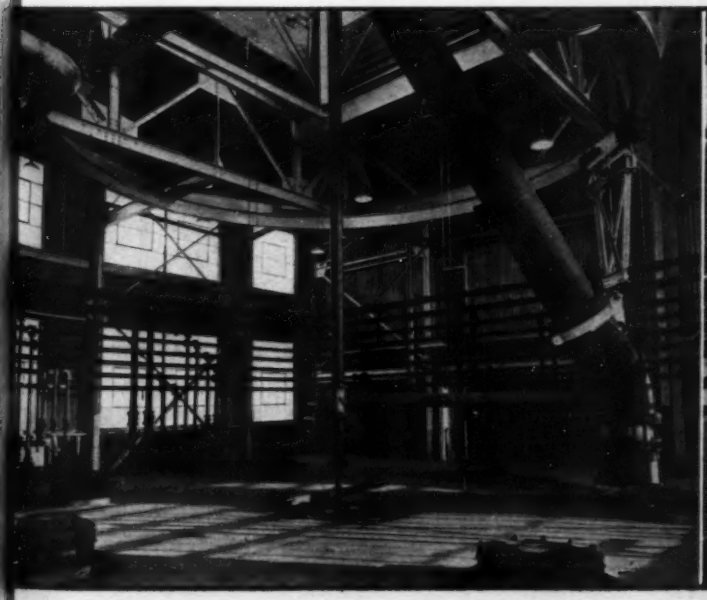
Fourdrinier and Press Part Details

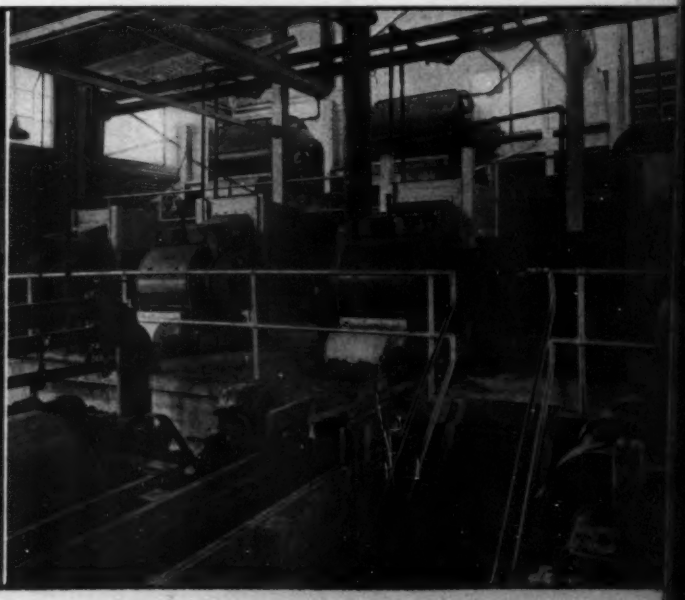
The flow box is lined with stainless steel. It has cypress partitions and baffles and a 72-inch slice.

Two shake sections, with provisions for adjusting the shake within a range of 100 to 400 shakes a minute, have been provided for the fourdrinier part.

A 36-inch suction couch roll is equipped with anti-friction bearings. Eight flat suction boxes are provided under the wire. There are two presses. The upper press rolls are 30 inches in diameter with a one-inch rubber covering. The lower press rolls are of 32-inch cast brass and of the suction type. The presses are equipped with heavy anti-friction bearings. Two felt

Left—Tops of diffusers and spout connection to cyclone. Right—Pulp screening and thickening layout





conditioners are provided for the wet felts.

Some Dryer Section Features

The dryer section consists of 48 60-inch dryers, which are made of close grain cast iron, bored inside and turned and ground outside. They are designed for 50 pounds working pressure. In addition, there is a 42-inch receiving dryer and six 48-inch felt dryers. Provisions have been made for the future addition of 36 60-inch dryers.

Arrangement for Condensate Removal

A dryer drainage system of the forced vapor circulation type has been installed. It is suitable for 80 60x208 inch dryers. The condensate and vacuum pump has a capacity of 300 gallons of condensate per minute at a discharge pressure of 30 pounds per square inch at the pump, in addition to 11 cubic feet of air per minute. A four pass counter-current type of heat exchanger is installed in the condensate return line from the flash steam section of the paper machine. The control valve for the paper machine dryer is a 12 inch regulator valve of the diaphragm type.

Calenders, Reel, and Winder

Two stacks of calenders are provided. The first consists of one 18-inch roll, three 16-inch rolls, and one 32-inch roll, while the second stack consists of one 18-inch roll, five 16-inch rolls, and one 32-inch roll.

The reel is of the Pope patent uniform speed type with 42-inch driving drum equipped with roller bearings. The reeling drums also have roller bearings. A pair of unwinding stands is provided with a dynamic braking arrangement in addition to a braking generator.

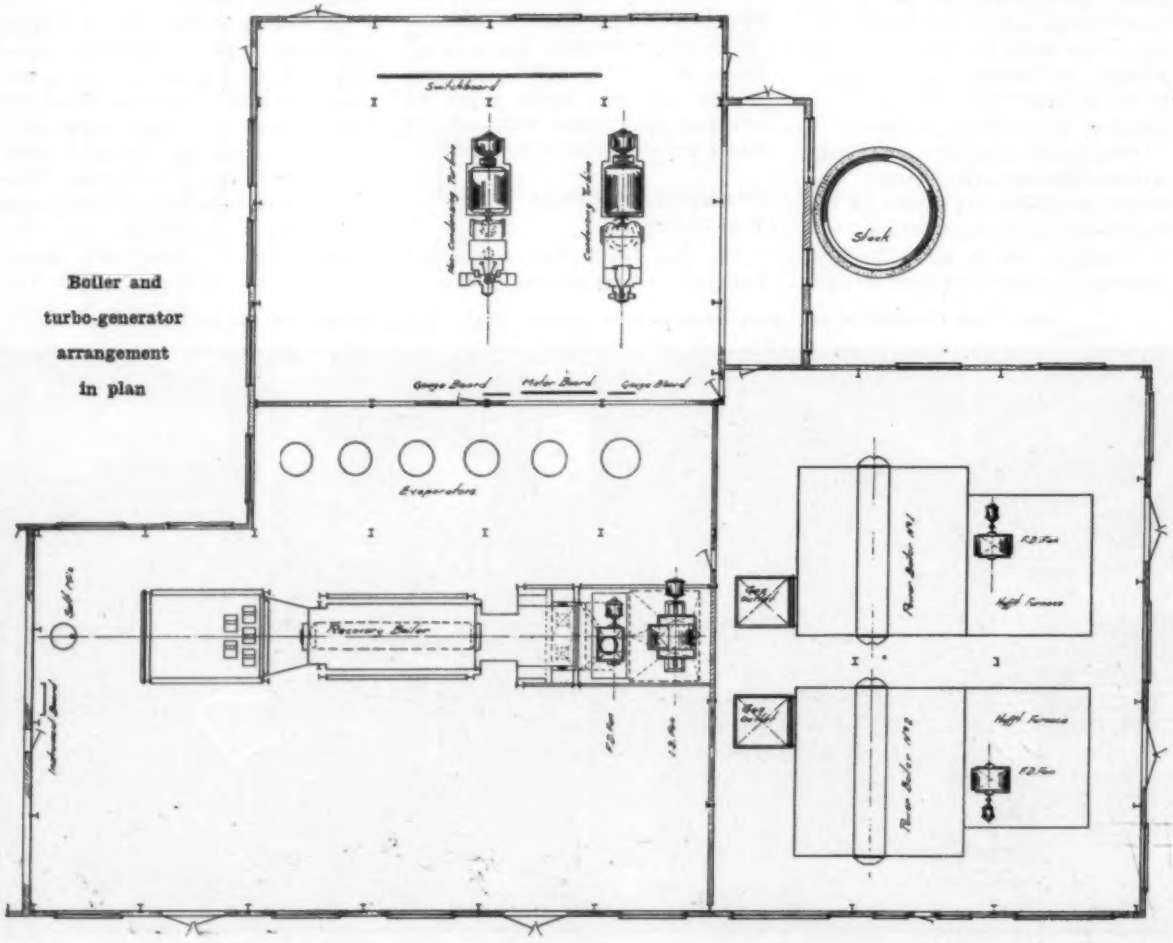
The slitter and winder has a 204-inch drum face with provision for a roll with maximum diameter of 60 inches at a maximum speed of 3,500 feet per minute.

Paper Machine Drive

A synchronous motor generator set and an auxiliary DC generator for starting and inching, supplies the power to the section motors of the paper machine. These motors are ventilated by a motor-driven blower.

Care to provide for every operating contingency was taken into consideration when designing the control equipment. Individual control stations were installed for each section with a master control station to stop or adjust the speed of the entire machine.

A machine hood of ¼ inch Transite panelling, bolted with brass bolts, and a ventilating system with three exhaust fans were supplied for the machine room, two for the roof supply unit and one for the felt supply units.



Boiler and turbo-generator arrangement in plan

Installation of five Jordans (left), and paper machine from wet end

Machine Room Cranes and Finishing Department Equipment

Crane equipment in the machine room includes a 10-ton reel-off crane with a span of 24 feet 10 inches and a 35-ton three-motor traveling crane with a 55-foot span, which runs the full length of the machine room.

The finishing department is equipped with a 108-inch rewinder for 60-inch rolls, a 114-inch sheet cutter, and 108-inch layboy.

Three freight elevators are located respectively in the finishing room, digester building, and causticizing building.

Unit Heaters for Screen and Beater Rooms

The screen and beater rooms are supplied with unit heaters of the high velocity type, and the finishing room with unit heaters of the low velocity type.

Black Liquor Evaporation

Concentration of black liquor previous to burning takes place in the evaporator plant, which is located adjacent to both the recovery and wood burning boilers. The boiler rooms are close to the saw mill in order to give most efficient conveyor arrangement for the handling of fuel.

The weak black liquor, which contains about 17 per cent solids, is brought to 55 per cent concentration through the use of the evaporator unit. This unit has six bodies and is of the vertical long-tube type, quintuple effect. It is of solid steel construction with steel tubes and has capacity to evaporate 88,100 pounds of water per hour. Three tanks have been provided for the storage of strong black liquor; two of these are 47,000 gallons capacity and one is a 34,200 gallons capacity.

Preparation of Smelt

Previous to delivering the concentrated black liquor to the recovery boiler, salt cake is added in a mixing tank. A bucket elevator is used to elevate the salt cake from storage to the feeder bin. Liquor burning is carried out in a Tomlinson recovery unit in the power plant. After the addition of salt cake, the concentrated black liquor is sprayed into the furnace by oscillating sprays and strikes against the walls of the combustion chamber. Partial dehydration takes place during the course of spraying. The spray of liquor deposited on the walls of the furnace then becomes completely dehydrated and the black ash drops on the hearth where air is admitted to support partial combustion. The products of combustion pass through the spray to assist in dehydration of the particles in flight. Air is admitted to the furnace above the upper level of the bed of black ash to complete the combustion of the carbon monoxide and also of such hydrocarbons as are distilled from the ash on the walls.

The recoverable chemical content in the ash melts and flows through a tap hole and is eventually delivered to the causticizing plant for further treatment.

Major Items of Causticizing Equipment

The recausticizing equipment includes two causticizing tanks, seven white liquor tanks, twelve settling tanks, two lime mud tanks, three filtrate tanks, and a lime sludge filter which is equipped with a vacuum pump.

Handling of Saw Mill Refuse for Fuel

In view of the novel use of saw mill refuse to provide both the steam and electric power requirements of the two plants, a description of the power plant may be of interest.

The saw mill refuse is first hogged and then moved on a system of conveyors which elevate the material over the top of the fuel storage house which has capacity for a two-day supply for the power boilers. Extremely flexible storage and handling facilities have been provided. Fuel may be either

dumped at an outside storage point, in the storage house, or in either of two 5,000 cubic foot storage bins in the boiler house.

A chain conveyor is provided to take the fuel either from the outside storage point or from the bottom of the storage house to a point near the adjacent barking drum and wood room where bark and rejects from the screening of pulpwood are added to the hogged saw mill refuse by other conveyors. Dry planing mill shavings and sawdust are also delivered to the fuel storage house through a blowpipe system. The fuel is then elevated to the storage bins in the boiler house by a belt conveyor. Spiral conveyors push the fuel from the bins to the stokers. Naturally, the burning of the fuel with an average water content of 50 per cent presented a special combustion problem. Wood burning stokers were installed, which work in conjunction with Dutch ovens in each of the two power boiler furnaces. These stokers consist of inclined grates so designed that the fuel becomes partially dried before reaching the combustion zone.

Power Boiler Details

Each of the power boilers consumes about 30,000 pounds of fuel per hour. Provision has been made for the burning of oil as an auxiliary fuel. This has been done to guard against any interruption in the supply of solid fuel as well as to provide for increasing the steam generating capacity to take care of peak loads. Under normal conditions the supply of wood fuel is almost adequate and little oil will generally be used.

The boilers, which generate steam at a pressure of 425 pounds and a temperature of 675 deg. Fahr., have a capacity of 75,000 pounds of steam per hour when burning wood alone and 120,000 pounds when burning oil and wood. An additional 50,000 pounds of steam per hour, or about 8,300 pounds for each ton of pulp, is expected to be generated in the unit in which the black liquor is burned. This will give a total steam generation of 200,000 to 290,000 pounds of steam per hour, depending on the type of fuel used in the power boilers.

The products of combustion are discharged to a reinforced concrete chimney 14 feet in diameter and 250 feet high. Induced draft fans are installed on both the boiler and recovery units. Forced draft is also supplied to the boilers.

Remote operated control devices are provided to control the supply of air to the oil burners and to the wood burning stokers. Remote control of uptake dampers and oil valves is from boiler panel boards.

Turbo-generator Equipment

Extreme flexibility was necessary in the designing of the power plant. This provides steam to the paper mill and saw mill as well as electric power with varying demands of each plant, and this problem was made particularly complex by the fact that paper mill production is a continuous operation while the operation of a saw mill is intermittent.

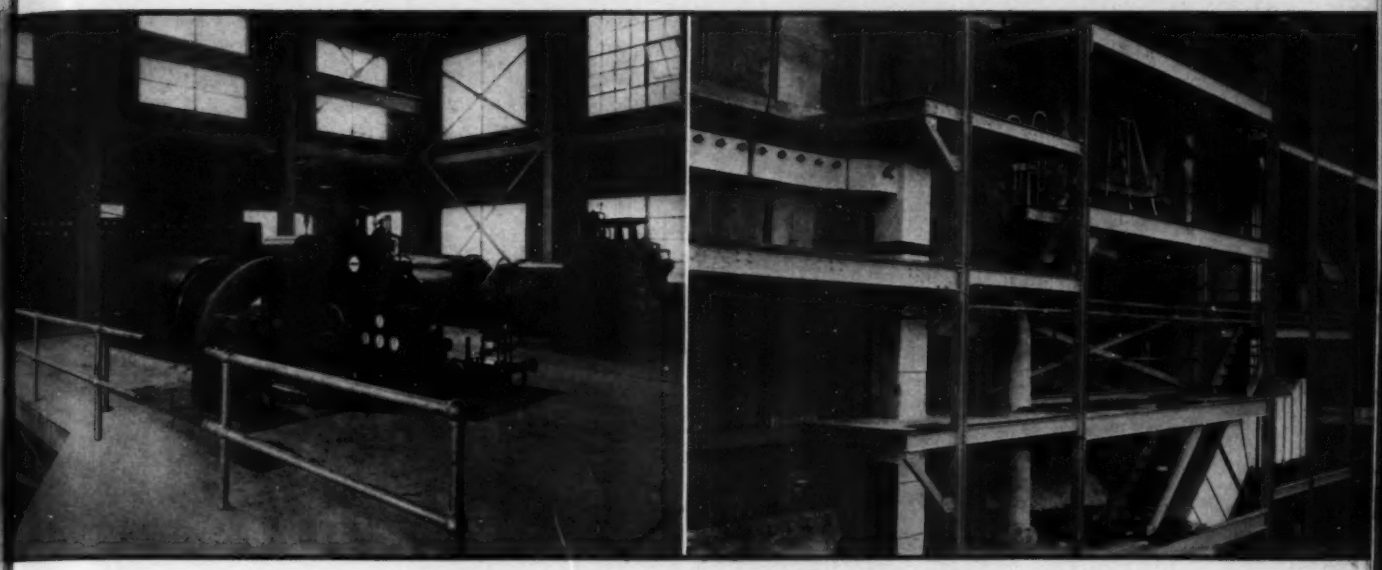
Both condensing and non-condensing turbo-generators were installed so that the load of either could be varied to give the proper output of steam either from the exhaust or the bleed of the turbines.

Both turbines are 2,300 volt, three phase, 60 cycle, 3,600 r.p.m. units. The non-condensing turbine has a capacity of 3,750 kva. and extracts steam at 150 pounds gauge pressure and exhausts at 60 pounds gauge pressure. The condensing turbine has a 4,375 kva. rating; it bleeds at 60 pounds and exhausts to a condenser at 28 inches vacuum.

Steam Flow Arrangement

Examination of the accompanying flow diagram shows that the turbines are supplied from a 400-pound steam loop. The non-condensing turbine extracts into a 150-pound header, which supplies steam to the saw mill, the power plant auxiliaries, and the pulp mill. Its exhaust, as well as the bleed from the condensing turbine, goes to a 60-pound header which provides steam for the paper machine,

Left—Drive side of paper machine from dry end. Right—Line of vacuum pumps



Left—The turbine room. Right—Recovery boiler installation

the evaporator and a closed feed water heater. Exhaust steam from fan turbines at 5 pounds pressure supplies a deaerating heater.

Reducing valves have been installed to maintain proper balance in the various headers. A valve and a desuperheater provide for the automatic flow of steam from the 400-pound loop to the 150-pound header should the demand for steam exceed the amount extracted from the non-condensing turbine. Another reducing valve permits the flow of steam from the 150-pound header to the 60-pound header in case of a deficiency at that point. Relief valves are provided on the headers to take care of any excess pressures.

A further aid to maintaining balance of steam and power requirements has been provided through the installation of both steam and electrically driven auxiliaries. The existing power plant at the saw mill will have its load transferred to the new plant and will be held only for stand-by service.

Water Treatment and Storage

The plant is located near the Blackwater River from which a 6,000 gallon per minute pump draws water for boiler feed as well as pulp and paper plant use. The part intended for boiler feed is filtered and is otherwise subjected to water treatment. A deaerator with a capacity of 200,000 pounds per hour has been installed.

Part of the paper mill service water is carried through the condenser and generator air coolers before being heated for paper plant use.

Water storage is provided in a steel tank 85 feet in diameter and 20 feet high. A 100,000 gallon elevated steel tank and 1,500 gallon per minute pump is being used for fire protection.

Building Construction Features

The principal buildings are of steel and brick construction with Wolmanized plank and composition roofs.

The lighting system is a four-wire 120-208 volt three-phase system, designed to provide a minimum of eight foot candles illumination.

A separate piping system for drinking water is installed together with an artesian well and service pump.

The office building provides a sharp contrast to the strictly utilitarian design of the plant itself. This building is of frame construction and has been designed along early Colonial lines, in keeping with the historical traditions of Southern Virginia. The executive offices are beautifully appointed with finished panelling of carefully selected and matched woods.

Other Advantages of Location

The location of the plant at Franklin, Virginia, has other advantages than those offered by the large supply of saw mill refuse. Railroad service is provided by the Seaboard Airline and the Southern Railroad and, in addition, the Camp Manufacturing Company has 250 miles of its own privately-owned trackage extending into the surrounding timberland. Transportation facilities are further augmented by a network of excellent highways, and the Blackwater River is navigable for tugs and barges, which will handle finished products and also bring in pulpwood. A log conveyor from the river to the pulpwood storage yard has been installed.

Plant Investment

The paper mill and power plant, along with site and other accessories, represents an investment of about three million and a half dollars. In addition to its common stock, ownership of which is divided equally between the two parent organizations, the company has $1,250,000 in 5 per cent cumulative preferred stock outstanding and $1,400,000 in 4¼ per cent bonds maturing January 1, 1947.

The parent organizations guarantee the preferred stock and bonds as to principal and dividends or interest.

Official Personnel

The officers and directors of the Chesapeake-Camp Corporation were drawn from the parent organ-

izations: J. L. Camp, Jr., president of Camp Manufacturing Company, is president. Elis Olsson, president of Chesapeake Corporation, is vice president. Other officers include: H. W. Ellerson, vice president, who is president of the Albemarle Paper Manufacturing Company; John M. Camp, secretary and treasurer, who is vice president of Camp Manufacturing Company; and Hugh D. Camp, who is general manager of the plant. Directors include the above officers and also P. R. Camp, vice president of Camp Manufacturing Company; W. C. Gouldman, secretary and treasurer of Chesapeake Corporation, and Julien H. Hill, president of the State Planters Bank and Trust Company of Richmond, Virginia.

Community Benefits of Plant Operation

The operation of the plant will give employment to about 300 persons, and has stimulated residential building in Franklin. Groups of extremely attractive homes are being put up for employees and are greatly adding to the beauty of an already charming town.

Purveyors of Equipment and Supplies

Refuse, log and chip conveyors, Chain Belt Company.

Knotters tailing conveyors, Jeffrey Mfg. Company.

Conveyor belting, New York Rubber Corp.

Barking drum, Fibre Making Processes, Inc.

Chipper and chip crusher, D. J. Murray Mfg. Company.

Chip screen, Orville Simpson Co.

Evaporators, Swenson Evaporator Company.

Digesters, Blaw-Knox Company.

Pumps, Allis-Chalmers Mfg. Co.

Vapor condenser, C. H. Wheeler Mfg. Company.

Elevators, Westbrook Elevator Mfg. Company.

Diffusers and tanks, Norfolk Tank Corp.

Diffuser dump valves, Fibre Making Processes, Inc.

Digester blow valves, Yarnall-Waring Company.

Knotters, screens, and thickener, Improved Paper Machinery Corporation.

Refiners, The Bauer Bros. Co.

Pulp mixers and breaker beaters, Dilts Machine Works, Inc.

Jordans, E. D. Jones & Sons Co.

Vacuum save-all, Improved Paper Machinery Corp.

Motors, Westinghouse Electric & Mfg. Company.

Air compressor, Ingersoll-Rand Co.

Paper machine, Pusey & Jones Corporation.

Dryer drainage system, Midwest-Fulton Machine Company.

Vacuum pumps, Nash Engineering Company.

Cranes, Northern Engineering Works.

Machine clothing:

Dryer felts, William E. Hooper & Sons Company.

First press felts, Waterbury Felt Company.

Second press felts, Albany Felt Company.

Fourdrinier wires, Appleton Wire Works.

Vickery felt conditioners, Bird Machine Company.

V-Belt drives, Gates Rubber Co.

Scales, Toledo Scale Co.; Fairbanks, Morse & Company.

Winder and rewinder, Cameron Machine Company.

Lime sludge filter, Improved Paper Machinery Corp.

Forced draft and induced draft fans, B. F. Sturtevant Co.

Recovery unit, Babcock & Wilcox Company.

Concrete stack, Rust Engineering Company.

Deaerating and closed heaters, Elliott Co.

Power boilers, Babcock & Wilcox Company.

Wood burning stoker, M. A. Hofft Company.

Boiler feed pump and fan turbines, Elliott Company.

Water softening and filter plant, Roberts Filter Mfg. Company.

Boiler meters and flow meters, Bailey Meter Company.

Combustion control, Hagan Corp.

Chemical feeders, International Filter Company.

Turbo generators, Westinghouse Electric & Mfg. Company.

Condenser, Allis-Chalmers Mfg. Co.

Power and light wiring, Allegheny Industrial Electrical Co.

Piping, Pittsburgh Piping & Equipment Company.

Water filter screens, Glens Falls Machine Works, Inc.

Elevated water tank, Chicago Bridge & Iron Company.

Machine hood, heating, and ventilating system, J. O. Ross Engineering Company.

Insulation and pipe covering, Philip Carey Company.

Boiler settings, Rust Engineering Company.

Valves, Chapman Valve Mfg. Co.; Edward Valve & Mfg. Co.; Merco Nordstrom Valve Co.; Valley Iron Works Company.

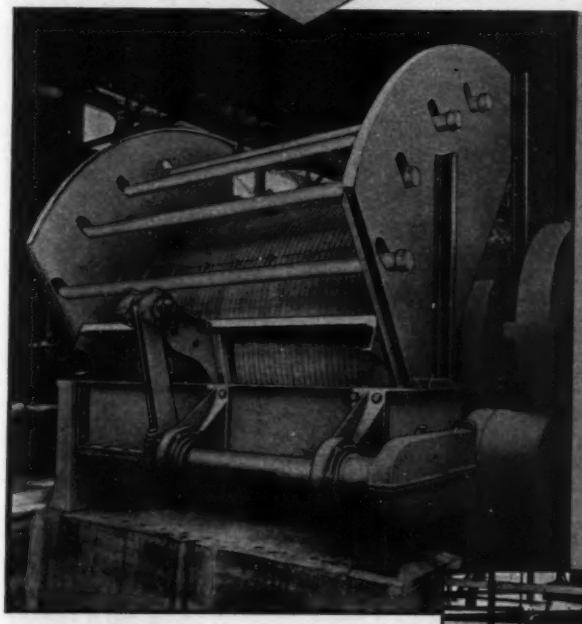
Steam traps, Armstrong Steam Trap Company.

IN THE NEW MILL OF THE

Chesapeake-Camp Corporation

IMPCO

EQUIPMENT HANDLES STOCK



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"IMPCO" equipment furnished for the splendid new mill of Chesapeake-Camp Corporation consists of — —

2 KNOTTERS

4 CENTRIFUGAL SCREENS

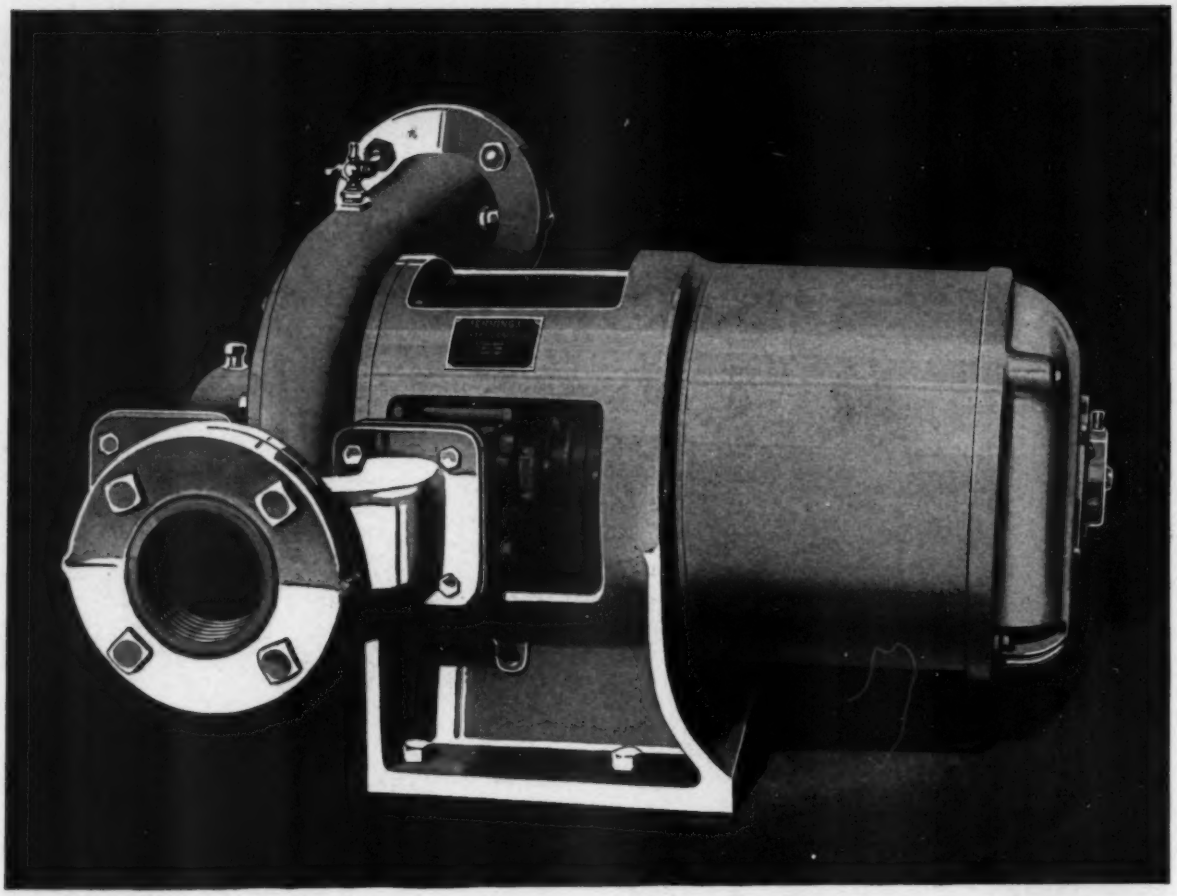
1 VACUUM THICKENER

1 VACUUM SAVE-ALL

1 VACUUM LIME SLUDGE FILTER

IMPROVED PAPER MACHINERY CORPORATION

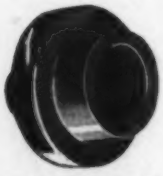
Nashua, New Hampshire



THE JENNINGS CENTRIFUGAL PUMP.

Manufactured in a variety of designs to meet individual plant needs. Furnished in standard and self priming types. Standard close coupled type shown above is very compact and may be installed anywhere. Suction and discharge assembled in any desired position. Impeller designs engineered for high efficiency, and in variety to meet any type of service. Also in unit assembly with Nash Vacuum Pumps for combinations of liquid and air. Bulletin 236 tells the story. Your copy is waiting.

Non-Clog type impeller for solids up to ½ inch.



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A closed impeller for Double Suction Pumps.

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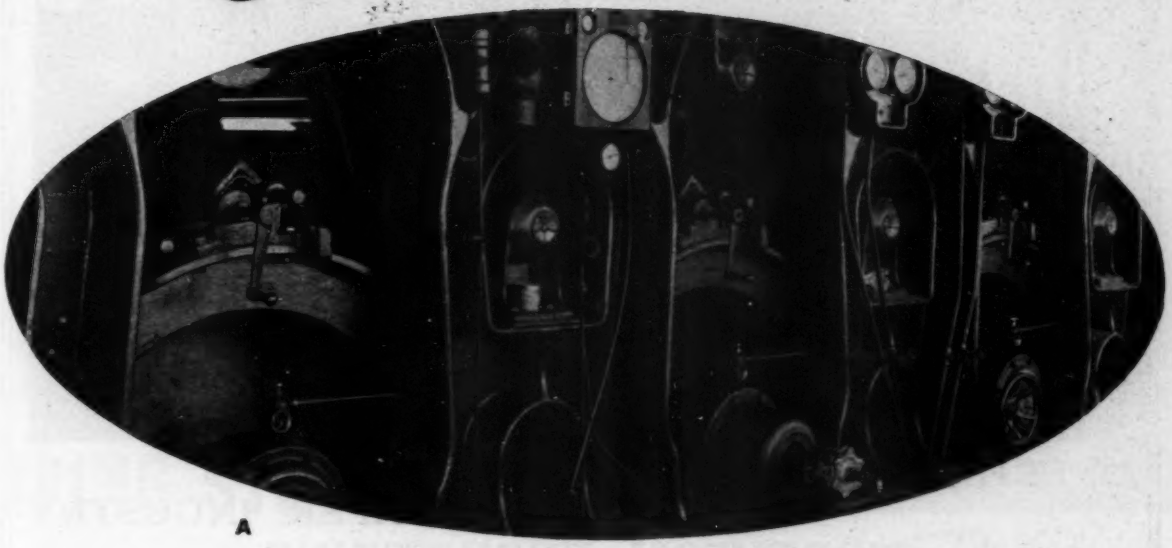
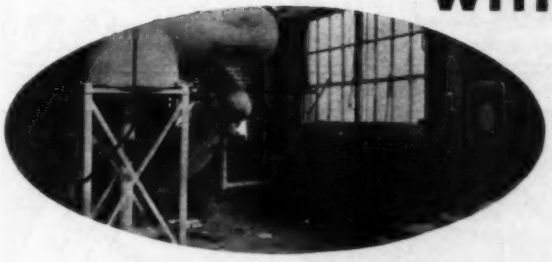


A

WITH MODERN CONTROLS



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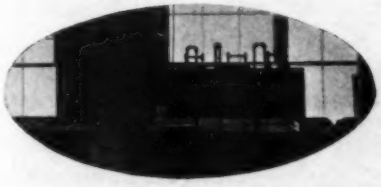

C

D

Control units at the new Chesapeake-Camp mill exemplify the completeness of the modern Masoneilan line: a line developed by engineers who know paper making problems; a line which offers equipment for control of all process factors from power house to paper machine; a line which has won the preference of engineers and superintendents in a score of United States and Canadian mills. Illustrated are—

A. Masoneilan temperature control on dryers.

B. Masoneilan temperature control at desuperheater.

C. Masoneilan pressure-temperature recorders and indicating steam flow controller for digestors.

D. Masoneilan No. 27 pressure reducing valves used on primary and secondary steam lines.

Whether your problem lies in power house, pulp mill, bleach plant or paper mill investigate Masoneilan Controls—the complete, modern, engineered line.

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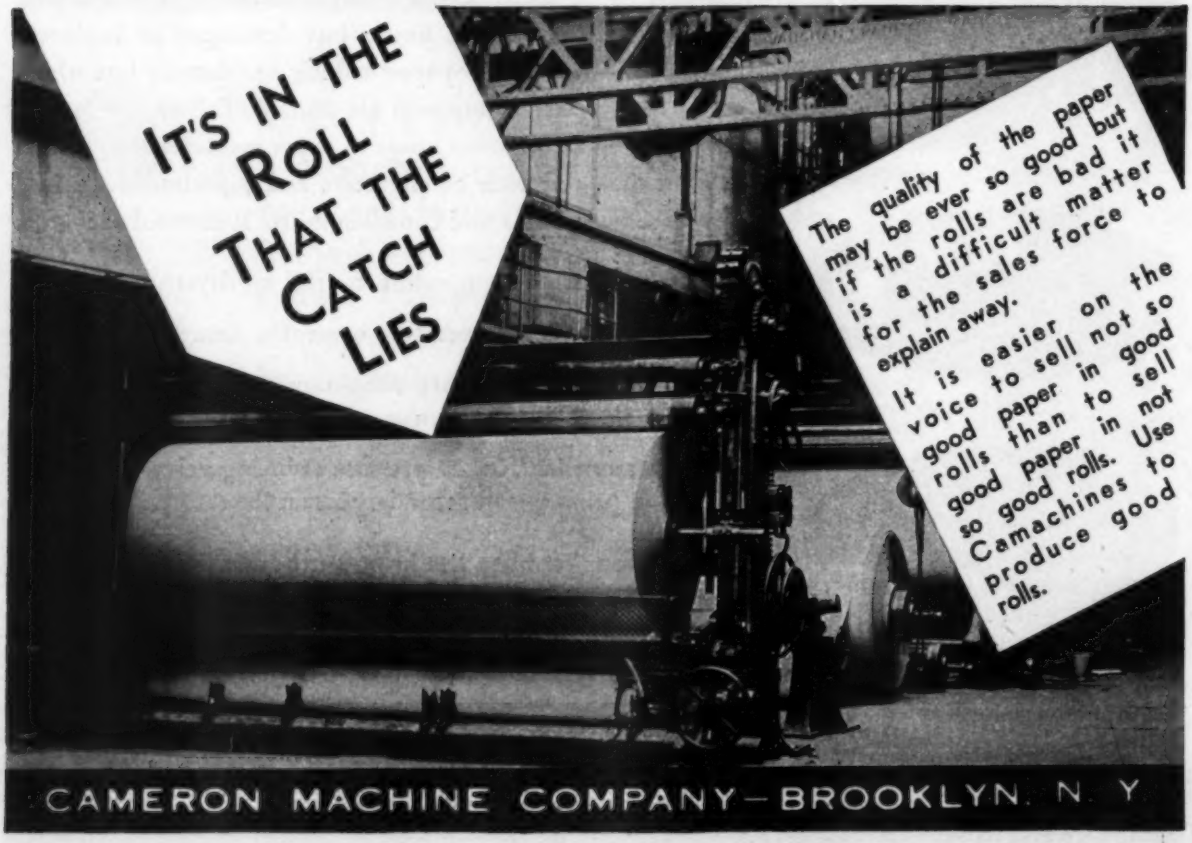
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The quality of the paper may be ever so good but if the rolls are bad it is a difficult matter for the sales force to explain away.
It is easier on the voice to sell not so good paper in good rolls than to sell good paper in not so good rolls. Use Camachines to produce good rolls.
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AT *Chesapeake-Camp Corporation*

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The complete piping system of this newest addition to the Southern paper industry—consisting of an all-welded 400 lb. main steam line, 150 lb. and 60 lb. turbine extraction lines, stock, liquor, white water, wash water and compressed air lines—was fabricated and erected by Pittsburgh Piping in record time.

Having been the piping contractor for many of the largest Kraft mills, Pittsburgh Piping is thoroughly familiar with the problems peculiar to the paper industry.

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Pittsburgh Piping

Top: Swivel arrangement for filling diffusers from cyclone. Diffuser wash piping in the background.

Above: Stock line piping feeding and interconnecting Jordans.

Paper Sketches ---

AT ONE PERIOD OF THE 17TH CENTURY, RAGS FOR PAPER MAKING WERE SO SCARCE IN ENGLAND THAT AN EDICT WAS PASSED FORBIDDING THE PRACTICE OF WRAPPING THE DEAD IN LINEN.
PAPER PLATES APPEAR FIRST TO HAVE BEEN USED IN THE SUMMER OF 1880 BY A POPULAR OPEN-AIR RESTAURANT IN BERLIN. PATRONS OF THIS RESTAURANT WERE SO INTRIGUED WITH THESE DISHES THAT THEY TOOK SAMPLES HOME AS SOUVENIRS.
ANCIENT ROMAN AUTHORS USUALLY WROTE ONLY ON ONE SIDE OF THE PAPYRUS. WHEN THEIR BOOKS WERE CAST ASIDE SCHOOL BOYS USED THE REVERSE SIDE OF THE SHEETS FOR DOING THEIR EXERCISES.
THE CUT OF PULPWOOD IN NEW YORK STATE, ACCORDING TO A PUBLISHED ESTIMATE, DECLINED FROM 475,000 CORDS IN 1919 TO 210,000 CORDS IN 1934.

Cleaning Belting

W. F. SCHAPHORST, M. E.

OIL is one of the principal enemies of the pulp and paper mill belt. There are oils on the market that stay put—that do not drip—and there are enclosed bearings which do not permit dripping—but the average paper plant has not yet arrived at the use of dripless oils and bearings. Therefore the problem is: "What is the best way in which to remove oil from oil soaked belting?"

Although oil does not damage some belts seriously an excessive amount of oil *does* cause slipping. As soon as slip occurs there is an unnecessary power loss which is directly proportional to the slip. For instance, if the slip amounts to 2%, the power loss is 2% and the production loss is also 2%. If the slip is 5%, the power and production losses are 5%. In other words, percentage of power and production loss is identical with the percentage of slip.

Continued use of a leather belt soaked in mineral oil will develop cracks from fiber abrasion inside. The natural animal oil in high grade leather protects these fibers against sawing one on the other. Harsh mineral oil removes this film of natural animal lubricant, and allows the fibers to contact and develop abrasion. Degreasing will remove the mineral oil and redressing with animal oil will replace the film on each fiber, which means pliability without internal damage.

Excessive slip may also cause burning of the belt. Burning is often more serious than the power loss, cracking and abrasion combined. It can be surprisingly expensive.

There are two general ways in which to tackle this oil soaked belting problem mentioned above, namely:

First: Improve your oil conditions if possible so that there will be no leakage or splattering of oil onto the belt. By so doing, it will not be necessary to give the belt a periodic cleaning.

Second: Use a good belt that is as immune as possible to being harmed by oil and then clean that belt periodically—provided it does become oil soaked despite all you can do.

Numerous cleaning agents are recommended for washing leather belts such as a mixture of petrol and turpentine; gasoline; naphtha; kerosene; benzol; carbon tetrachloride; aqua ammonia; alcohol; soda and water.

In general these rules may be followed: Immerse the loosely wound coil, on edge, in the liquid, and allow to soak over night. Then stand on the other edge for 10 hours. If the belt is dirty in addition to being oil soaked, the dirt usually loosens and settles to the bottom. The dirt that does not loosen and settle can generally be removed with ease by brushing or scraping. To hasten drying the belt may be run through an ordinary washing wringer, provided the belt is not too wide. If too wide for a wringer, dry with a cloth.

A putty knife or similar broad scraping device having rounded corners is a good tool for scraping leather belts. Fibers of a belt, whether leather or of other material, must never be injured.

Place dry sawdust on the belt after laying the belt flat on the floor and clean with a stiff broom. Then turn the belt and do the same to the other side. After this it is a good plan to pack the belt in powdered chalk, Fuller's earth, or fine sawdust and keep it in a warm place. The warmth improves capillary attraction and will aid the material in absorbing the oil. After the belt is dry lubricate it with a suitable dressing recommended by the manufacturer of the belt.

When using gasoline or naphtha be extremely careful. According to the U. S. Bureau of Mines if gasoline is stored in an open place, as in a pail, the room in which the pail is left will soon be filled with an easily explosible mixture. The limits of explosibility are between 1.5 per cent and 6 per cent of gasoline vapor in air. In other words, only a little gasoline vapor is needed to render air explosive—one and one-half cubic feet of gasoline vapor for each 97½ feet of air. One gallon of gasoline can, when perfectly mixed, render 2100 cubic feet of air explosive.

Some types of pulleys also collect oil and become "oil soaked". An oil soaked belt on oil soaked pulleys is a very poor combination for power transmission. Pulleys can be degreased as well as belts by a process very similar to that described above.

Sometimes hot irons are applied to belting to drive out the oil; blow torches are resorted to; or where available, steam is used. Steam is preferable to hot irons of course, but even with steam the utmost caution must always be exercised in its use. Steam is an excellent cleanser for many purposes, but it must be remembered that many kinds of belting cannot withstand the high temperatures that go with steam. The temperature of steam at atmospheric pressure is 212 deg. Fahr. The higher the steam pressure the higher the corresponding temperature.

A temperature of 212 deg. Fahr. is too hot for most rubber belting. One prominent rubber belt manufacturing concern states that its belting is not affected by heat up to a temperature of 200 deg. Fahr.; and that where higher temperatures are to be encountered it should first be consulted. That is good advice regardless of the kind of belt. Even where steel chains are used, one must be careful in high temperatures or lubrication difficulties will be experienced. Of course steel chains can be cleaned safely with steam.

Balata belting is more sensitive to high temperatures than rubber. Its temperature should be kept down to less than 110 deg. Fahr. At 125 deg. balata gum can be moulded, therefore NEVER heat balata belting in *any* way.

According to one authority, oak tanned leather belting should not be subjected to a temperature higher than 115 deg. Fahr., which means, of course, that oak belting, also, must not be cleaned with steam. It can't stand it.

Nor should impregnated cotton belting be cleaned with steam because the steam will very likely wash out the impregnating compound. Without the compound cotton belting does not give satisfactory results. Stitched canvas belting should not be used in temperatures higher than 140 deg. Fahr.

Waterproof leather belting of the special mineral tanned variety can safely be cleaned with low pressure steam as it is not harmed at 212 deg. Fahr. But be sure to replace the mineral oils which are almost certain to be driven out. Unless the belt is treated after steam cleaning in accordance with the directions of the manufacturer the fibres will be left dry and brittle and failure thereafter may be premature.

◆ ◆

◆ Install New Equipment in Nekoosa-Edwards Mills

Added washing capacity and slush storage is the latest move of the Nekoosa-Edwards Paper Company to completely modernize, speed up and expand its two large mills at Nekoosa and Port Edwards, Wis. The equipment includes one large tank with agitator and an Impco vacuum filter.

The tank and the filter both occupy space formerly occupied by Nepco's original Nekoosa mill alkali plant. The tank is cylindrical, of reinforced concrete, twenty-seven feet in diameter by thirty-two feet high, extending from the basement to the operating floor level of the diffuser room. The vacuum washer is located on the upper floor level so as to discharge directly into the storage tank. With the thirty-two foot height available, the vacuum is obtained by a water leg, no pump being required in the operation.

The tank makes available twenty tons of A. D. pulp storage at four per cent consistency. The fact that slush storage is available for the easy bleaching kraft will make it possible for Nepco to operate the wet machine capacity more economically since a greater percentage of the stock can be lapped on the Kamyr machine, taking advantage of the lower conversion cost.

The entire layout and design of this new equipment, as well as other recent extensive improvements, were made by the engineering department of Nepco, in collaboration with the operating staff. The construction work was carried out by the Nekoosa maintenance department.

Dilts Installs Testing Laboratory

FOR some time the Dilts Machine Works, Fulton, N. Y., has felt the need of a completely equipped testing laboratory. This is because technical control in the pulp and paper mills has progressed to such a point that it has reflected in a constantly increasing demand on the machinery manufacturer for specific information on his equipment. Competition among the manufacturers has also exerted a beneficial influence in forcing them to exert every possible effort to improve their products. This, of course, means test and re-test practically without end. Further than this, Dilts has within the last few years placed on the market a number of pieces of radically new equipment. Naturally, any new device must be tested and the ideal place for this is right in the shop before the device is placed in a mill. In this way many of the "bugs" which always appear when a new idea is crystalized are eliminated before the idea is put into operation in a mill. Then, too, customers often have mill problems in the solution of which the manufacturer can in many cases be of valuable assistance.

It is because of all these factors that Dilts made plans last year to equip a laboratory which would enable them to set up various pieces of new or old equipment and make tests on them approximating as nearly as possible prevailing conditions in the average mill.

Listed among the pieces of equipment in the laboratory are a Williams sheet mold, oil hydraulic press, sheet dryer, and moisture oven. The freeness tester is a Canadian Standard tester. Bursting, tearing, and tensile testing equipment is that which has been set up as standard by the Technical Association of the Pulp and Paper Industry. A Dilts laboratory type beater has been set up. In addition there is also photomicrographic equipment for studying the minute characteristics of pulping materials. This latter is often most essential for a complete picture of work done on pulp by a particular piece of machinery, as for instance the Hydrafiner or any other piece of refining equipment.

From time to time additional pieces of apparatus will be added as needed to round out a still better testing laboratory. Any or all of this equipment is available to anyone in the industry who wishes to make use of it either themselves or with the aid of the Dilts organization. Already a number of stock preparation problems have been brought into the laboratory and earnest cooperation is being given to the respective companies in the development and solution of these problems.

In the same building which houses the laboratory, space has been provided for setting up various pieces of equipment which the company is in the process of developing preparatory to placing them on the market, and the laboratory is rendering assistance in making small scale test runs on the machinery with the end in view of determining such factors as proper design, efficiency, power requirements, optimum speed, wearing qualities, capacities, etc. Such information cannot help but be extremely valuable since it will eliminate much of the guesswork which always goes along when an entirely new piece of equipment goes into operation for the first time in a mill. Testing of new machinery has been going on almost constantly.

Naturally, considerable expense was involved in setting up and equipping such a laboratory, but Dilts feels that the benefits which will accrue both to the company and to its customers will more than offset the money spent. Dilts also feels that it has taken a progressive step which will make for an even better relationship between the company and its customers, and again expresses the desire to work with them to an even greater extent than in the past.

◆ Emmett Hay Naylor Resigns as Associations' Secretary

Secretary of both the Writing and Cover Paper Manufacturers Association for the past twenty-four years, Emmett Hay Naylor has resigned to retire from active business. This move has been his wish for several years, but he had been dissuaded in the past because of conditions in the industry. M. C. Dobrow, who has been connected with these associations for twenty-two years, succeeds Mr. Naylor as secretary.

Mr. Naylor became associated with the Writing Paper Manufacturers Association in 1914 as secretary-treasurer and built it up from a small association to the large one it is today. It is the oldest trade association in the United States, having been founded in 1819.

Mr. Naylor also organized the Tissue Paper Manufacturers Association and was secretary of the organization for ten years. He was also secretary of the Book Paper Manufacturers Association and the Stationery and Tablet Association but later gave up these organizations to devote all his time to writing and cover interests. He was one of the five to organize the American Trade Association Executives of which he was president and a long while a director.

His outstanding written work *Trade Associations — Their Organization and Management*, was produced in 1921 and is still a basic guide for many associations. In 1923, at the request of Herbert Hoover, then Secretary of Commerce, he wrote a complete history of trade associations in America.

Mr. Naylor is not only dean of all the secretaries in the paper industry but most of the trade association executives in the United States, among whom he has a host of friends. He will be seriously missed by all those who have benefited from his help and service.

◆ L. M. Benemelis Has New Post at White & Wyckoff

Lorenzo M. Benemelis is the new superintendent of the White & Wyckoff Manufacturing Co., Holyoke, Mass., it was announced by George R. Burkhardt, president and general manager. Mr. Benemelis succeeds Paul W. Bidwell, who resigned on January 1.

The new superintendent has been associated with White & Wyckoff for some sixteen years having come from Eaton, Crane & Pike Co., to take charge of the wedding goods division. Since that time Mr. Benemelis has been made assistant superintendent.

◆ SIDNEY MITCHELL, president of the United Paperboard Company, passed away recently at the age of 62. He was formerly a director of the Chicago Stock Exchange and became president of the United Paperboard firm in 1906.

Interstate Commerce Commission Authorizes Increased Freight Rates

ON the afternoon of March 8, 1938, the Interstate Commerce Commission handed down its decision in Ex Parte 123, known as the Fifteen Per Cent case. The principal conclusions reached as related to the paper industry, according to Charles W. Boyce, Executive Secretary, American Paper and Pulp Association, are as follows:

The railroads are authorized to increase existing rates 10 per cent but in doing so they are required to take into account and consider as part of the increase authorized, the increases already applied as a result of Ex Parte 115, most of which had become effective on November 15, 1937, on December 20, 1937, and, as to transcontinental traffic, on December 30, 1936. They are not, however, required to reduce any of the increases authorized under Ex Parte 115.

The resulting rates which will be published in tariff form in the near future, will provide for increases ranging, it is estimated, from 5 to 8 per cent over existing rates, instead of 15 per cent over existing rates as proposed by the petition of the railroads.

In the main, the decision of the Commission is in accord with the position of the paper industry. However, the Commission did not sustain the request of the industry for exemption in the case of pulpwood, or for a maximum limitation of four cents in the case of paper and two cents in the case of pulp. Failure to obtain provision for these maxima is minimized due to the fact that the authorized increase is in the amount of 10 per cent over the old rates rather than 15 per cent superimposed upon the existing rates.

The Commission did, however, adhere to the position of the paper industry that there should be no further increase in the rates on bituminous coal.

The increases under Ex Parte 115 and 123 are summarized in the following table and the total increases are shown in the last column:

Summary of Freight Rate Increases on Paper and Paper-Making Materials Under Ex Parte 115 and Ex Parte 123

Product	Increases Under Ex Parte 115 and Effective Dates	Increases Under Ex Parte 123	* Total Increase
Newsprint	None	10%	10%
Paper, Paperboard and Paper Bags	2c per 100 lbs. December 20, 1937	10% to include the 115 increases	10%
Transcontinental shipment	3c per 100 lbs. December 30, 1936		10%
Wood Pulp	None	10%	10%
Pulpwood	None	10%	10%
Bituminous Coal	10c per ton November 15, 1937	None	10c per ton
Lime	20c per ton November 15, 1937	10% to include the 115 increases	10%
Clay	20c per ton December 20, 1937	10% to include the 115 increases	10%
Salt	40c per ton December 20, 1937	10% to include the 115 increases	10%
Salt Cake	40c per ton December 20, 1937	10% to include the 115 increases	10%
Soda Ash	40c per ton December 20, 1937	10% to include the 115 increases	10%
Sulphur	None	10%	10%

* The Ex Parte 115 increases are to stand in all cases in which those increases are greater than the 10% increase authorized in Ex Parte 123.

◆ IT IS BEING RUMORED that a third large paper and pulp plant is to be erected in North Carolina, according to reports from that state. A local newspaper has reported that the company is investigating sites for the new enterprise in and around the Piedmont region of North Carolina.

◆ BROWN COMPANY'S LOCAL MILLS required 20,539 fully loaded freight cars last year to bring raw materials and haul finished products away. An increase of 20 per cent over 1936, this total is equal to one car for each man, woman and child in Berlin, N. H., the location of the Brown mills.

◆ THE CONTAINER CORPORATION OF AMERICA has appointed London and Krudener, Inc., New York City, as sole selling agents for kraft sulphate pulp produced at the Fernandina, Florida mill of the Container organization. It is expected that the Florida mill will make available substantial tonnage of pulp for ready marketing at all seasons.

◆ Salesmen Hear Addresses by Museum Staff

The Western Division of the Salesmen's Association of the Paper Industry held an open meeting March 28 at the Hotel Sherman in Chicago. John W. Diggs, president, presided at the meeting which was held following a luncheon. The only item of business considered at the meeting was the election of Frank E. Prentiss, western manager of Hollingsworth & Whitney Company, Chicago, as assistant vice president.

A special program had been planned featuring addresses by members of the staff of the Museum of Science and Industry. The various organized bodies of the paper industry are becoming conscious of the value and importance of their support in the development of an extensive exhibit of paper making and paper products which is being planned by the Museum.

The speakers were introduced by William Bond Wheelwright, publisher and editor of *Paper and Printing Digest*, who, as a member of the History Committee of Tappi, has already presented this subject to the Technical Association in the form of a paper delivered at the annual meeting. Mr. Wheelwright has advocated the establishment of a suitable exhibit to commemorate the 250th anniversary (in 1940) of the establishment of paper making on the Western Hemisphere.

Dr. Fox, director of the Museum, spoke of the advantages the Museum will offer to the general public; Dr. Moulton, Curator of Chemistry, outlined a plan that has been worked out for the exhibit of paper making and paper products; and Mr. D. M. McMaster, Assistant Curator in Graphic Arts, spoke interestingly of exhibits contained in the new west wing, just opened to the public and also told of what is being done in the space devoted to the Graphic Arts Division. His talk was illustrated with moving pictures made at the Museum.

◆ Appointments Announced by Magnus Chemical Company

Three new appointments have been announced by the Magnus Chemical Co., Garwood, N. J.

Alfred L. Gough becomes resident sales representative in the state of Rhode Island, Jas. J. O'Keefe becomes resident sales representative covering the state of Virginia and Linwood D. Knight will represent Magnus in the state of New Hampshire. All three men have had much previous experience in the industrial field.

◆ Robert T. Houk, Sr.

Vice-president of the Mead Corporation and prominent business executive of Dayton, Ohio, Robert Thurston Houk, Sr., passed away March 10 at the age of 75.

Mr. Houk was born in 1862 in Dayton, the son of a well-known lawyer and former member of Congress. He was educated at the local schools and his first job was with A. A. Simonds of the machinery firm known today as Simonds Worden White. His first association with the paper industry came in 1883-84 when he was employed by H. E. Mead & Company. Later, Mr. Houk left for New Mexico to become assistant superintendent of a silver mine and on his return to Dayton became a reporter on the *Dayton Journal*, covering the police beat for several months.

He joined the National Cash Register Company in 1889 and remained with the firm for eighteen years, leaving in 1907 to become superintendent of the old Stoddard-Dayton Motor Car Company. When the latter company sold out to United Motor Company he stayed on a year and then returned once more to the Mead paper enterprises, where he remained ever since. Before becoming vice-president of the Mead Corporation, Mr. Houk had served as secretary.

Throughout his active life Mr. Houk was interested in and gave support to many a public movement. Known affectionately as "Doc" by his small army of friends he had endeared himself to many by his genuine friendliness to his business associates and personal acquaintances.

Mr. Houk is survived by his widow, two sons and a daughter. One son, George Washington Houk, is executive vice-president of the Hawley Paper and Pulp Company. Another son, Robert T. Houk, Jr., who passed away two years ago, was president of the George H. Mead Company.

◆ Westinghouse to Construct New Facilities in Mass.

Early construction of new manufacturing and warehouse facilities at the East Springfield (Mass.) works of the Westinghouse Electric & Manufacturing Company, has been announced recently. The buildings will be of the latest approved design for modern factory buildings and will be of brick, glass, concrete and steel construction.

It is reported by L. E. Osborne, works manager at East Springfield, that the new manufacturing building will have approximately 100,000 square feet of floor space. To this will be transferred the manufacture of beverage coolers now carried on at the Chicopee Falls (Mass.) plant. Also into this new building will be moved the manufacture of water coolers and commercial refrigeration units in order to provide better manufacturing facilities and future expansion. The warehouse will be two stories high and will include approximately 230,000 square feet.

◆ V. D. Simons

Venning Dodge Simons, 66 years old, well known consulting engineer of Chicago, passed away Thursday, March 24th at Tucson, Arizona, where he had gone for the winter because of failing health. He is survived by his widow, two daughters and three sons.

He was born August, 1st, 1871, in Allegan, Michigan, and gained his education from study and experience. His natural engineering ability and interest led him into the paper industry in Kalamazoo. In 1897 he became superintendent and manager of the public

Venning Dodge Simons

utility plant at Battle Creek. He went to Wisconsin Rapids in 1903 to take charge of the design and installation of electrical and hydraulic equipment for the new Consolidated Water Power and Paper Company mill. The first variable speed paper machine drive was installed at this mill under his direction. Three years later he became manager of the Biron plant of the Company. In 1912, he patented the sectional electric drive for paper machines which has since become an important feature of modern paper making. After participating in other engineering and construction projects on the West Coast and in Wisconsin, he opened an engineering office in Chicago in 1914 and has maintained it continuously since that time.

Mr. Simons was known throughout the industry as a consultant and his practice included the design and construction of many new pulp and paper mills and rehabilitation and enlargement of existing properties. The generation of steam electric power in connection with paper mills is a science brought to new levels of perfection under his guidance.

He was the inventor of numerous processes used in the industry and at his death he was actively engaged in research on new and progressive ideas for the paper industry—subjects of never failing interest and almost fully absorbent of his energies. Mr. Simons was a Mason and member of the Western Society of Engineers.

◆ Arthur B. Daniels

Arthur B. Daniels, president of the L. L. Brown Company, Adams, Mass., and nationally prominent in the paper industry, passed away March 4. He was 76 years of age and had been in ill health for some time.

Mr. Daniels was first connected with the Brown company at the age of 17. He was made treasurer and general manager in 1892 and was elected president in 1919. He had been with the company for 60 years.

Mr. Daniels was sought for leadership in many commercial fields. He served as president of the Writing Paper Manufacturers Association in 1915; as president of the American Pulp and Paper Association in 1916 and 1917; as an incorporator, vice-president and treasurer of the Knickerbocker Portland Cement Co. from 1908 to 1917 and as president from 1918 to 1920; and at the time of his death was president of the Grelock National Bank. He was also a director of the American Paper Exports Inc., of New York City.

Surviving Mr. Daniels are his widow, two sons and a daughter.

◆ H. S. Furminger Granted Patent for Paper Machine

H. S. Furminger, Appleton, Wis., who has been connected with the paper industry for more than fifty years and who retired several years ago as superintendent of the Fox River Paper Company, was granted a patent for a new type of paper machine. Two opposed fourdrinier wires, having their upper ends traveling toward each other, are included in the machine. A cylinder mold is placed between the two wires. Paper webs are formed on the wires and transferred to the felt. Mr. Furminger has received approval to four claims of originality and improvement.

◆ THE BRUNSWICK PULP AND PAPER COMPANY shipped its first bleached sulphate pulp manufactured from south Georgia pine on March 9. The shipment was destined to the Scott Paper Co., Chester, Pa., and the Mead Corporation, Chillicothe, Ohio.

◆ A. E. Wackerman Speaks on Forest Fire Problem

That greater state and federal appropriations be granted for protection against forest fires was recommended by A. E. Wackerman, industrial forester of the Seaboard Railway, at the Conservation Conference of the Southern Pine Association, held March 23 in New Orleans.

Mr. Wackerman added that efficient fire protection is, of course, provided all southern states but only to the limited extent possible with available funds. Usually protection is a co-operative undertaking administered and partly financed by the states with the federal government assisting and the land owners or local governments assuming a substantial share of the cost.

◆ Goodrich Container Wins Award in Package Contest

A corrugated shipping container for garden hose developed by the B. F. Goodrich Company of Akron, Ohio, was an outstanding winner in the 1937 All-America Package Competition, sponsored by *Modern Packaging*.

The container, designed and manufactured by the Inland Container Corporation, Indianapolis, Ind., is available in different sizes and colors to accommodate different lengths and grades of hose. It is die-cut in the middle in such a way as to form a square opening, with tuck-type locks in every side joining the cover and the bottom of the box. A new process of printing on corrugated board has been used, not only for the all-over color of the box itself but for gay, spring flower decorations and for lettering in identification and instructions.

◆ Palmer-Bee Makes Change

Palmer-Bee Co., Detroit, manufacturers of power transmission and materials handling machinery, made the first organizational changes in a number of years at its last meeting of the board of directors.

Wm. E. Bee, president of the company since its founding in 1905, assumes the position of chairman of the board and Geo. A. Bee is now president and general manager. J. E. McBride remains as vice-president. A. J. Leckie is treasurer and C. F. McLaren is assistant treasurer. D. N. Sweeney, former bank official, assumes the office of secretary. L. F. Miller is assistant secretary.

The company recently opened an engineering and sales office in Louisville, Ky. N. B. Knight, engineer, is in charge.

◆ ALBEMARLE-CHESAPEAKE CO., INC., has purchased the Fort Madison (Iowa) mill of the Hinde & Dauch Paper Co., it was reported recently. The mill proper and the surrounding real estate were included in the transaction. The Iowa mill has not been used regularly by Hinde & Dauch and was operated only in emergencies and during rush periods.

◆ Thirteenth Power Show

The Thirteenth National Exposition of Power and Mechanical Engineering will be held this year at the Grand Central Palace, New York City, during the week of December 5-10, it was announced recently.

A large percentage of the space on three floors of the Grand Central Palace has been enaged by manufacturers who have exhibited at previous power shows. At the last exposition, in 1936, held at the Grand Central Palace, visitors came from 1,286 cities and towns in 42 states of the United States and from 109 cities and towns in 35 foreign countries. The total registered attendance was 38,943.

The Exposition, as in all of its twelve earlier appearances, will be managed by the International Exposition Company under the personal direction of Charles F. Roth, president.

◆ Murray M. Rubin Resigns Post at Fraser Companies

Murray M. Rubin, formerly associated with the technical organization of Fraser Companies, Ltd., has resigned effective May 1, 1938. Mr. Rubin is a brother of Milton T. and Walter R. Rubin, also well-known in the paper industry. Although Mr. Rubin has not yet completed definite plans for the future, it is likely that he will enter the field as technical consultant.

In addition to his work in the industry, Mr. Rubin is rather well known in trade literature by reason of his contributions to journals in the paper field. He is a member of the Association of Harvard Chemists, Technical Association of the Pulp and Paper Industry, Technical Section Canadian Pulp and Paper Association and the American Institute of Chemists.

◆ Fort Wayne Co. Sells Mill to Southern Kraft

The Hartford City (Ind.) paperboard mill of the Fort Wayne Corrugated Paper Co., Fort Wayne, Ind., has been purchased by the Southern Kraft Corp., which will take over possession immediately, it was announced. The Fort Wayne company will continue to operate its box board plants at Hartford City, Ind., and Connelsville, Pa., as well as its straw board mill at Vincennes, Ind.

The consummation of the sale and subsequent reorganization took place at the recent annual meeting of stockholders and board of directors of the Fort Wayne organization. At the meeting Frank P. Koester, vice-president, treasurer and general manager, was elected president and treasurer succeeding Henry J. Bowerfield who has been elected chairman of the board.

◆ Huntington Paper Mill Sold to Clark Mfg. Co.

The land and buildings of the Huntington Paper Company in Huntington, Mass., have been purchased by Alvin S. Clark, president and treasurer of the Clark Manufacturing Co., Holyoke, Mass. No statement was made regarding the purchase or whether the company's dandy roll business was to be transferred to Huntington except that Mr. Clark had "no intention of leaving Holyoke."

◆ 1937 Record Year for Safety at duPont Co.

The best safety record in the history of the E. I. duPont de Nemours and Company was made during 1937, the company announced recently. Up to this time the most impressive record was made in 1936.

With employment 11 per cent over the previous year, duPont plants experienced a frequency rate of 1.85 as against 2.02 in 1936. The severity rate in 1937 was .76 well below the 1936 average of .86. One plant completed two full years without a major injury during which time 4,109 men and women worked 11,363,000 exposure hours. Forty-seven duPont plants, laboratories and construction projects worked through the entire year without a single lost time accident.

◆ Hollingsworth & Whitney Buy More Land in Alabama

The Hollingsworth & Whitney Company, Gardiner, Maine, has purchased an additional piece of land at Magazine Point, Mobile, Alabama, as a further preliminary move in the process of acquiring a complete mill site and timberland. Before the company is prepared to announce definite plans or to award contracts in connection with its rumored $5,000,000 sulphate mill, there will be similar moves made. It is reported that the company's purchases in Alabama involved some $401,000. The most recent purchase was some 222 acres of adjoining land to previous purchases.

◆ A. D. Naylor

A. D. Naylor, former secretary of the American Paper and Pulp Association, passed away March 8 at Mt. Vernon, N. Y. Mr. Naylor was a brother of Emmett H. Naylor who resigned several weeks ago after 24 years service as secretary of the Writing Paper Manufacturers Association. A. D. Naylor was an officer of the A.P.P.A. from 1915 to 1918.

◆ Permutit Water Softening Plant Shipped to Fernandina

The Permutit Company recently chartered a ship to make delivery of what they claim is the largest sea water regenerating zeolite water softener to the Fernandina Pulp and Paper Company, Fernandina, Fla. The plant consists of specially constructed 14 foot diameter zeolite softeners and 8 foot diameter by 20 foot long filters. It will handle 10,000,000 gallons of water per day and will produce a finished process and boiler feed water. It is fully automatic in operation.

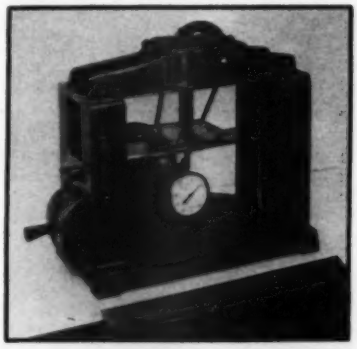
◆ G. D. Bowne is Manager of New Westinghouse Section

In order to meet the changing conditions in industrial markets the Westinghouse Electric and Manufacturing Company recently announced the formation of a new Industrial Department. This department will consist of six industry sections: Metal Working; Petroleum and Chemical; Public Works and Communications; General Mill; and Marine Electrification. G. D. Bowne, who has been manager of the General Mill Electrification Section, continues in that relationship. Included in the latter section are important industries such as paper, textiles and food.

◆ Crush Tester for Board and Other Papers

An instrument, developed in the Sandusky laboratory of the Hinde and Dauch Paper Company under the direction of Pierre Drewsen, Chemical Engineer, and designated as the Hinde and Dauch Paper Company Crush Tester, is being offered to the trade by Testing Machines, Inc., 460 West 34th Street, New York, N. Y. The design of this instrument is based upon the experience gained from a number of years of testing straw paper and corrugated container stock. Essentially, it is a mechanism that applies a vertical load to test sample and measures its breaking load in pounds through the deflection of a bar upon which it rests. The frame of the machine consists of a base "B," four vertical columns "C," and a top "T," all bolted together into a substantially rectangular structure. In the center of the top "T" is a plunger mechanism which consists of a threaded plunger bar "P" that is slotted longitudinally as indicated at "S." A key in the top frame slides in this slot and prevents the plunger bar from turning sideways. The thread engages a worm "W," which is operated by a wheel "X." This wheel, in turn, is direct connected to a pulley which is driven by a motor "M." An integral taper pin secures plunger bar "P" to a plunger "A," a square piece of steel 3½ in. x 3½ in.; while a steel bar "D" rests on two steel shoulders "E." These shoulders may be moved lengthwise of the bar by means of screws "F" through turning a knurled knob "G." Two steel points "H" with compression spring "J" press down upon the top of the bar from above the points at which it rests on the shoulders "E." A gauge "K," the dial of which is actuated by a stem "L" containing an adjusting nut "Q," contacts the bottom of bar "D" and records the deflection of the bar when under load. Resting on two wedges "V" on top of the bar is a saddle "U" which is held in a laterally rigid position by means of four lugs which engage two center notches on the bar. An operating switch, not shown in the drawing, is located on the left side of the instrument; while wiring between the switch and motor is concealed under the base "B."

In operation, the operating switch returns to neutral position when the operator's hand is removed and reverses the motor to run the plunger up or down as desired. Should the motor, for any reason, continue to run the plunger bar up beyond a reasonable point, the taper pin in the plunger will let go and the plunger bar eventually will work its way out of the top of the machine and fall out. On the other hand, if the plunger bar continued to run downward beyond a point of approximately 350 lb. pressure, the belt slips. Likewise, when a load is lifted, the dial on gauge "K" maintains its position until released through the pushing upward of adjusting nut "R."



Hinde and Dauch Crush Tester

It has been found quite satisfactory, when testing uncombined paper samples to use paper strips 2 in. x ½ in., or 6 in. x ½ in., which are coiled into a cylinder and held in place in a circular template. If desired, stop shoulders can be made integral with the saddle so as to fit the template and center the sample properly. The testing of uncoiled strips of flat paper requires a special attachment that is fitted to the plunger and to the saddle. For flat crush tests on single face or double face board, circular samples of 10 square inches appear to be the simplest to prepare and test. Rectangular pieces, however, can be used in the same way.

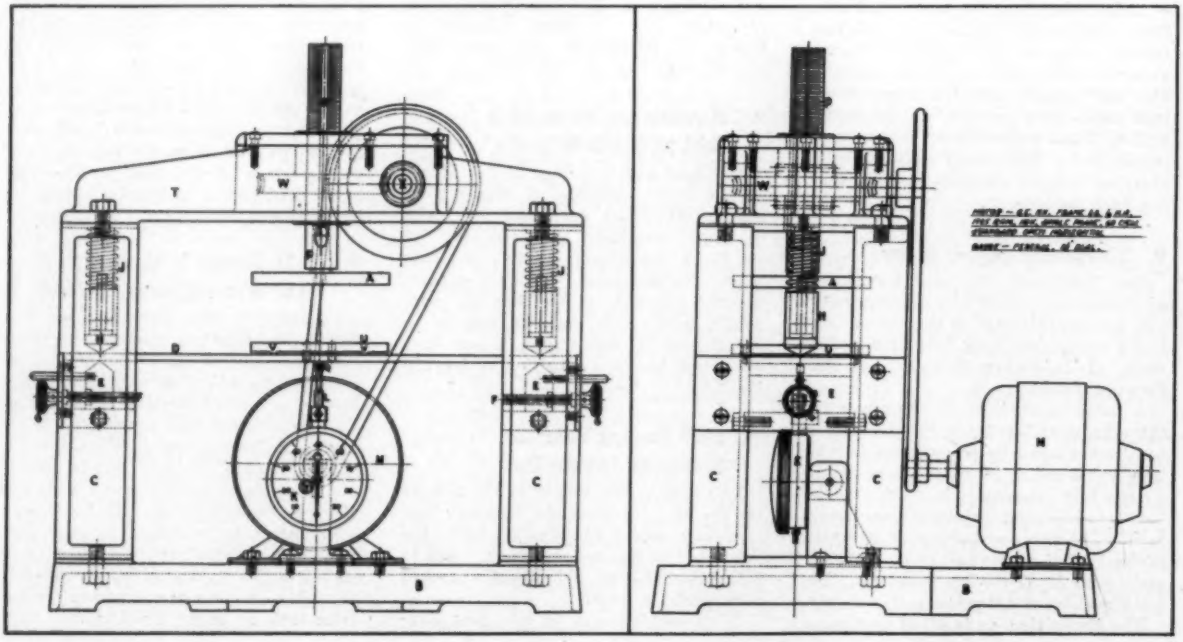
Space available and the range of movement of the plunger makes it possible to test any specimen up to a cube of 3½ in. on a side.

The device can be checked for accuracy in about 4 or 5 minutes, and, if out of adjustment, can be made accurate in a very simple way.

◆ Mildew-Proof Mill White Paint

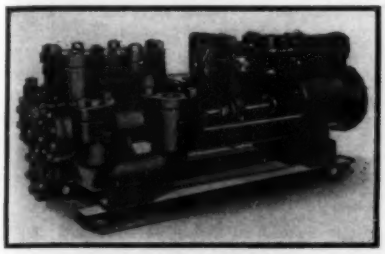
A mildew-proof mill white paint has been announced by The Billings-Chapin Company, Cleveland, Ohio. This paint is said to contain a special non-yellowing fungicide which effectively kills parasitic spores on the painted surface. The fungicide content, likewise, is said to blend smoothly with the oils and oxides without effecting the brushing characteristics or the smoothness of the finished film. In addition, it is claimed that the light reflectivity and color life of the paint is not impaired by the presence of the fungicide.

The paint is recommended by the manufacturer for use under conditions of high humidity and high temperatures.



◆ Duplex Steam Pump

Fairbanks, Morse & Co., Chicago, Ill., has announced a duplex steam pump with eight-cover side-pot type fluid end and improved piston valve steam end. This pump, designated as Fig. 6285



steam pump, was developed particularly for boiler feed service but is suited to many general industrial applications. Sizes are available for capacities up to 148 g. p. m. and for fluid end pressures up to 1000 lb. per square inch.

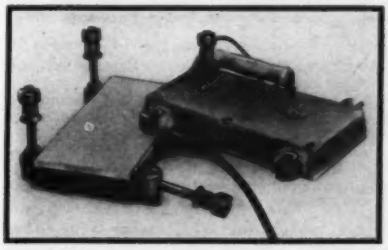
◆ Traveling Switchgear Exhibit

The General Electric modern switchgear exhibit, since May 1, 1937, has been presented in 70 cities in eastern, midwestern and southern states. It will return for engagements in New England after its current exhibits in Texas and Oklahoma, and possibly plans will be made for a tour of Rocky Mountain and Pacific states.

Since much switchgear is too large to be readily moved, many units in the exhibits are exact models, designed to show simply and easily just what the actual equipment will do. Manipulation of light beams enables the human eye to see, in a cutaway section of a large oil circuit breaker, for example, just what actually occurs during the interruption of high power circuits. It shows in slow motion how a blast of insulating oil is driven into the path of the arc stream with such volume and velocity that in less than a hundredth of a second the short circuit is extinguished and electric power service is safeguarded.

◆ Portable Belt Vulcanizer

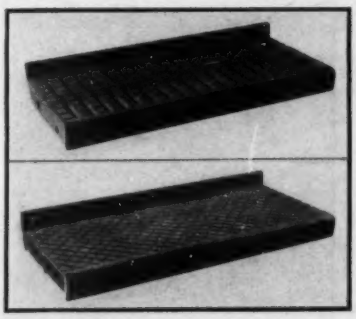
The Ton-Tex Corporation, 129 W. 22nd St., New York, N. Y., has announced the development of a portable belt vulcanizer with platens and frame housing of aluminum alloy. This vulcanizer weighs 36½ lb. It is designed for use on either a. c. or d. c. current. Both platens are heated, the temperature being controlled by a thermostat. The surface between the platens is 7 inches wide by 14 inches long. Clearance be-



tween pressure posts in center of plate is 10½ in. A rock maple handle is attached to the upper platen. The plate comes to heat in from 30 to 35 minutes from a cold start. In operating, the upper platen is swung edgewise off the lower, a single permanent bolt acting as the axis, and the lapped ends of the belt, with cement applied, laid on the lower platen. Then the upper platen is swung back into position and clamping pressure applied by tightening four nuts. Capacity of the vulcanizer is to 7 inch belts in one operation, or to 10 inch belts in two operations.

◆ Non-Skid Flooring and Stair Treads

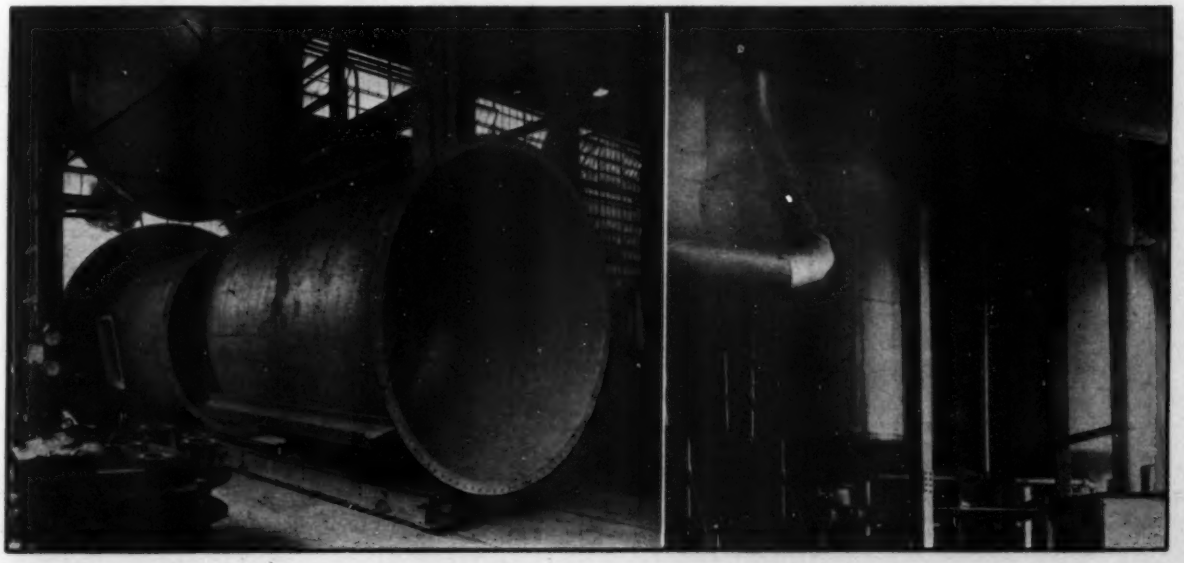
A non-slip safety metal, marketed under the trade name of Non-Slip ABSCO Metal, is being manufactured by The American Brake Shoe and



Foundry Company. In the production of this material, electric furnace abrasive grains are deeply and uniformly bonded into cast iron, bronze, aluminum or nickel silver at time of casting. The grains protrude sufficiently above the surface to give the non-slip characteristics. The material is recommended by the manufacturer for stair treads, ramps, industrial floors, platforms, elevator door sills, swing type door thresholds, trench covers, and other similar services.

◆ Rubber-Lined Chlorination Towers

Improved Paper Machinery Corporation, Nashua, N. H., recently designed two Thorne (patented) chlorination towers for installation in the bleach plant of a paper mill. Each of the two towers is about 10 ft. in diameter and 28 ft. high. The shells, individually built in two sections, are of steel, each section being lined with a 3/16 in. thickness of hard rubber and later bolted together in a vertical position with its related section. As a prevention against buckling or cracking due to temperature changes, horizontal and vertical expansion joints were built into the linings. Application of the linings was made through the use of the Goodrich Vulcalock process.



◆ Portable Mixer Bearing Improvement

Mixing Equipment Company, Rochester, N. Y., has announced the adaptation of a pre-lubricated sealed ball bearing for the extended bearing of its line of LIGHTNIN portable mixers. Its use,

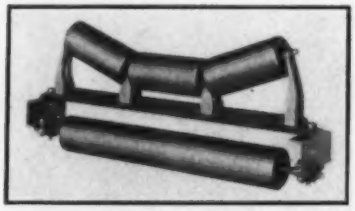
according to the manufacturer, guarantees that no grease or oil will ever run down the shaft, either from operation or careless lubrication. The manufacturer also states that a longer life is expected for the sealed ball bearing than for the standard bearing. Replacements can be made on existing mixers.

◆ Photo-Electric Reflection Meter

A new model of Dr. B. Lange's photo-electric reflection meter, designated as the New Universal Model, has been announced by Pfaltz and Bauer, Inc., Empire State Building, New York, N. Y. This device is used for the determination of reflection characteristics of solid and powdered substances. It is claimed to have increased sensitivity. Readings are made directly from a pointer instrument.

◆ Ball-Bearing Belt Idler

Jeffrey Manufacturing Co., Columbus, Ohio, has announced a new ball-bearing idler for carrying loads of semi and non-abrasive materials. This idler is of the



conventional 3-pulley, 20-degree troughing type, and is made for 14, 16, 18, 20, 24, 30 and 36-in. belts. Pulleys are of 4-in. diameter welded steel pipe with formed steel gudgeons welded in the ends. These gudgeons are connected within the pulley by steel tubing which prevents loss of grease into pulley proper. Shafts are of ⅝-in. seamless tubing and are held by set screws within machine bored holes in the stands. Entire idler may be lubricated from either end through pressure fittings. Base angles are inverted to shed material.

◆ Desuperheater

Northern Equipment Company, Erie, Pa., has introduced a desuperheater designed for either total or partial elimination of the superheat from steam to be used for process work or for auxiliaries built for reduced-temperature steam. The desuperheater, known as the Copes desuperheater, is installed in the steam line as a self-contained unit. It operates on steam from 212 deg. Fahr. to 1100 deg. Fahr. and is stated by the manufacturer to maintain the desuperheated steam temperature within close limits, regardless of changes in temperature of the superheated steam.

◆ New Line of Propeller-Type Fans

Propellair, Inc., Springfield, Ohio, has announced a new line of propeller-type fans. This new line has been designed for use in duct systems and for other similar problems where resistances to air flow are encountered. It includes Pro-

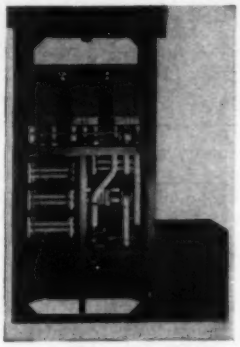
pellair fans in various sizes and various horsepower ratings to take care of a wide range of applications. The new construction, together with newly designed fan wheels, according to the manufacturer, enables the fans to economically handle duct system jobs which formerly required costly and cumbersome equipment.

◆ Motor Starting and Braking Control

A breaker combination for motor control, containing forward, reverse and braking oil circuit breakers, has been announced by Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Each breaker is electrically operated with an independent solenoid mechanism. The forward and reverse breakers are arranged to close their contacts when the solenoid is energized, while the braking breaker contacts are opened when the solenoid is energized. The brake contacts are spring closed when the mechanism is tripped, this being accomplished by a mechanical cross trip from either one of the other two breakers.

All three breakers are both electrically and mechanically interlocked, so that neither the forward or reverse breaker can be closed unless the brake contacts are open, the forward and reverse breakers cannot be closed together, the braking contacts cannot be closed while



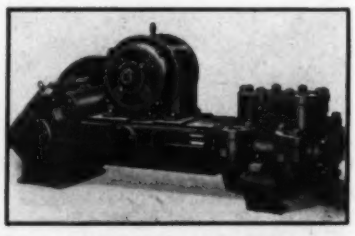
either the forward or reverse breakers are closed, and neither the forward or reverse breakers can be tripped open without closing the contacts of the braking breaker.

The breakers are 25,000 kv-a. rupturing capacity, 7500 volts, 600 amperes, with silver to silver contacts, "De-ion" interrupters, Micarta bushings and enclosed construction. The three breakers, mechanism, spring closing device and mechanical interlocks are all mounted on a single rigid steel plate, assuring proper alignment and correct adjustment.

The time for energizing the trip coil on either the forward or reverse breakers until the brake contacts make is .125 seconds. Both potential trip coils and undervoltage release tripping devices are used in order to assure positive tripping under all conditions.

◆ New Line of Duplex Power Pumps

A new line of duplex power pumps, having eight-cover side-pot type fluid ends and enclosed, self-oiling power ends with herringbone gears and roller bearings, has been announced by Fairbanks,



Morse & Co., Chicago, Ill. These pumps were designed for pumping water, oil or other free-flowing liquids in quantities up to 187 g. p. m. and at pressures up to 1000 lb. per sq. in. They are available with pulleys for belt drive or as complete F-M motor-driven units.

◆ New Catalogues and Publications

Automatic Transportation Co., Chicago, Ill.—Combining tabular matter and descriptive written material advantageously, this company has released an extremely informative catalogue dealing with the various types of electric industrial trucks, tractors and cranes manufactured by them. The catalogue contains a large number of photographs showing the equipment in use, handling paper rolls and bales. Complete specification data are given and diagrammatic drawings are included.

Black-Clawson Co., Hamilton, Ohio—A new bulletin (119-B) which describes the design and operation of this company's spiral hypoid gear dryer drive, has been issued recently by this firm. Construction and installation views are included in the release.

Black-Ray Lighting Co., Cleveland, Ohio—An interesting bulletin dealing with the use of the black-ray quartz-arc for fluorescence analysis, inspection and comparison, is found in a new bulletin (No. 14) just put out by this company. The bulletin shows how the instrument operates by means of short-wave ultra-violet radiations, and explains its uses from an industrial angle, illustrating same by means of interesting photographs.

Brown Instrument Co., Philadelphia, Pa.—A new folder (80-36) explaining how this company's flow meters, by metering steam, water, oil and other fluids, can effect economies, has been released lately by this company. The bulletin includes several illustrations of the installed meters.

Columbia Electric Manufacturing Co., Cleveland, Ohio—This company has just released a new bulletin (No. 700) dealing with the line of low voltage generators and motor generator sets manufactured by the firm. Photographs and written material present a clear picture of the details of construction of the units.

Flexrock Co., Philadelphia, Pa.—A recent bulletin issued by this company explains the construction and uses of Ruggedwear Resurfacer, a material manufactured by this firm for the repair of floors, platforms, etc. The product is made with cellulose.

Robert Gair Co., Inc., New York, N. Y.—This company has just put out a complete text book on the closure of paperboard shipping cases, written by their Mr. J. D. Malcomson. The booklet, containing 36 pages, covers the many aspects involved in the sealing of containers and the text is divided into four sections as follows: Adhesives—Hand Sealing and Automatic Sealing, Gummed Paper Tape, Metal Stitches and Staples and Metal Straps or Wire. The book is written in a clear and concise manner and contains many illustrations showing correct methods of sealing.

Griscom-Russell Co., New York, N. Y.—A new publication just issued by this company has to do with evaporators for producing distilled boiler feed from hard or salty raw water. The bulletin explains plant operating conditions for which evaporators are desirable, outlines general features and advantages of evaporators for producing pure boiler feed make-up and describes the design of the company's evaporators. The bulletin (No. 362) is 23 pages long and contains many illustrations of the equipment together with much valuable technical data.

W. & L. E. Gurley, Troy, N. Y.—This company has just issued a new folder (No. 1490) describing and explaining the operation and construction of the S P S paper tester. The folder explains the various tests the machine makes and includes a price list.

Hancock Valve Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.—A bulletin describing and illustrating the complete line of bronze valves manufactured by this company has recently been published by the firm. Particularly featured is the line of "500 Brinell" supervalves with the hardened stainless steel seats and discs. Price lists are included.

Invincible Vacuum Cleaner Mfg. Co., Dover, Ohio—Plant cleanliness is the theme of a new bulletin recently issued by this company. Showing the use of the company's industrial cleaners toward this end, the bulletin also describes by means of illustrations and reading matter, three types of portable vacuum cleaners manufactured by this firm.

New York State College of Forestry, Syracuse University, Syracuse, N. Y.—Of interest to those directly connected with forestry as well as pulp and paper manufacturers is the new bulletin (Vol. X No. 4) recently issued by the college, containing a list of publications relative to forestry, types of wood, lumbering, wildlife, etc. The bulletin contains a list of publications of four general classes consisting of bulletins of non-technical nature; technical publications; miscellaneous matter such as announcements, public education, service and extension information, reprints, etc.; and publications of the Roosevelt Wildlife Forest Experiment Station. Copies may be had on application to the Director of Forest Extension, New York State College of Forestry, Syracuse, N. Y.

Patterson Foundry and Machine Co., East Liverpool, Ohio—A new booklet issued by this company illustrates and describes the mixers suitable for liquids of both high and low viscosity manufactured by the firm.

Quigley Co., New York, N. Y.—Q-Chrome, a neutral chrome base refractory cement used in laying fire brick, chrome, magnesite and other refractory brick and tile in metallurgical and boiler furnaces, is described in a new bulletin (322-B) issued recently by this company.

BOOKS

Labor's Road to Plenty—Allen—W. Rucker, author of this volume, writes interestingly and thought-provokingly on a timely and most important economic subject. The American System of freedom of enterprise with rewards proportionate to productive effort, states Mr. Rucker, is the one thing, since pioneer days, that has marked the distinction between this country and all others. In his opinion, we can have full employment of the idle willing to work and larger annual incomes for every industrial wage-earner who does work. He points out that the American System is a system of pay proportionate to productivity and relates that factory employment opportunity varies directly and almost uniformly with the number of going plants. Annual wage incomes, he adds, can be increased only by increased productivity. The assumption that higher wage rates and restricted working hours, *per se*, can afford a solution to the problems of diminished purchasing power and unemployment, according to Mr. Rucker, find no confirmation in the actual results of large scale experiment, embracing an eleven-year period and some five million wage-earners. He also points out that labor's purchasing power increases and is best maintained in those industries paying relatively low percentages of values created as wages; and, that labor's employment opportunity increases and is best maintained in those industries where productive efficiency is highest.

The task for industrial and political leadership, cites Mr. Rucker, is to find a new and sounder basis for employee compensation, and, to educate labor and the public in the realizable benefits which it will provide. Mr. Rucker further relates that the principal of *Pay-Proportionate-to-Productivity* provides industry a base upon which it may stand before labor and the nation to show the futility and danger of wage-and-hour regulation and present to both an individualized plant compensation plan which provides labor, industry and the nation with an opportunity to produce and share in a far more abundant wealth than could any scheme of regimentation.

The revival of the American System, concludes Mr. Rucker, means essentially a revival of the spirit of progress in the knowledge that we have as yet barely more than opened the door to our ultimate possibilities for social and economic advancement.

Might it be suggested, as expressed by the author in his forward, that the book be *read not to contradict and confute, nor to believe and take for granted . . . but to weigh and consider.*

The book, attractively bound in cloth cover which is over-printed in gold, is priced at $2.50 per copy by L. C. Page & Company Boston, Mass., the publisher.

Business and the Robinson-Patman Law—This book, a symposium of sixteen contributors, edited by Benjamin Werne, S. J. D., is divided into four major parts. Part One treats of Anti-Trust Laws and Regulation of Price Competition; Economic Aspects of Some Recent Trade Legislation; The Robinson-Patman Anti-Discrimination Act; and Basing Point and Freight—Zone Price Systems under the Anti-Trust Laws. Part Two, devoted to Distribution, has individual chapters on Business under the Act; Legislative History; Retailing; Cooperatives; and Trade Associations. The chapters of Part Three include Marketing under the Act; Food; Paper; and Cost Defenses under the Act; while Part Four takes up the Effect of Two Pioneer Decisions under the Patman Law; the Substantial Lessening of Competition; and Remoulding the Anti-Trust Laws.

Jacob K. Javits, Counsel, The National Paper Trade Association of the United States contributed the material in Part Three on the paper industry. As in the case of Mr. Javits, each of the other contributors, has been directly concerned with concrete problems of interpretation and compliance with the law, either as legal adviser, economist, or marketer.

The book is a work of nearly 300 pages. Oxford University Press, 114 Fifth Ave., New York, N. Y., is the publisher. The price per copy is $2.50.

The Manufacture of Pulp and Paper, Volume IV (Third Edition)—Subjects treated in this book, which is arranged in nine sections, include: Pulping of Rag and Other Fibers; Processing Waste Papers; Beating and Refining; Fillers and Loading; Sizing of Paper; Paper Coloring; Water and Steam; Auxiliary Mill Equipment (Pumps and Pumping Apparatus, and Electrical Equipment); and Heating and Ventilation. A major change in this edition incorporates the material on Tub Sizing from Volume V with the chapter on Engine Sizing into a single section. The sections on Beating and Refining, Sizing, Fillers and Loading, Paper Coloring, Heating and Ventilation, Water, and Lubrication have been rewritten. The remainder of the volume has been corrected and brought up to date; and some new data on several items of equipment have been added.

The editor is J. N. Stephenson. The authors are: E. C. Tucker; Ed. T. A. Coughlin; Arthur B. Green; H. C. Schwalbe; Judson A. DeCew; R. O. Harper; R. M. Cobb; H. S. Spencer; H. L. Joachim; E. R. Laughlin; Hervey J. Skinner; Geo. D. Bearce; E. F. Doty; H. E. Stafford; E. B. Wardle; and J. O. Ross. In addition, a number of others contributed in the revision of the several sections.

The book is a fundamental and extensive treatment of the several phases of paper mill operation covered by it. It should be in the library of every student of papermaking, whether neophyte or veteran.

The price is $6.50 per copy; and the publisher is McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y.

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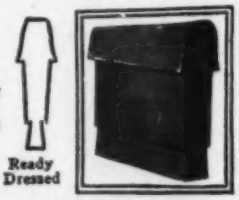

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The Paper Industry Safety Contest

July 1, 1937 to June 30, 1938

Cumulative Scores as of February 28

14 Mills Have Perfect Record

PERFECT SCORES

Division I—Paper and Pulp Mills

	PARTICIPANT	MILL	LOCATION
A	Container Corp. of America	Philadelphia	Pennsylvania
B			
C	Finch Pruyn & Co., Inc.	Glens Falls	New York
D	The Harriman Company	Harriman	Tennessee
	Bird & Son, Inc.	Phillipsdale	Rhode Island
	United States Envelope Co.	Morgan Paper Co. Div.	Lititz, Pa.
	Rogers Fibre Co., Inc.	Bar Mills	Maine
	The Mead Corporation	Nashville	Tennessee
	Hollingsworth & Whitney Co.	Aroostook & Cobbossee Mills	Gardner, Maine
	International Paper Company	Mill Number 23	Riley, Maine

Division II—Paper and Board Re-Manufacturing

Bird & Son, Inc.	Norwood	Massachusetts
Bird & Son, Inc.	Chicago	Illinois
Texas Corrugated Box Co., Inc.	Dallas	Texas
Bay West Paper Company	Green Bay	Wisconsin
Bemis Bros. Bag Company	East Pepperell	Massachusetts

IMPERFECT SCORES

	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP A	P-139	2	3	1.742
	P-108	3	7	3.832
	P- 19	4	4	4.570
	P-121	5	5	4.885
	P- 84	6	7	5.151
	P- 13	7	7	6.079
	P- 12	8	7	6.120
	P- 10	9	8	6.795
	P- 28	10	22	7.006
	P- 18	11	11	7.140
	P- 1	12	16	7.678
	P- 30	13	8	8.417
	P-136	14	10	9.303
	P- 21	15	10	9.817
	P- 69	16	13	10.180
	P- 23	17	9	10.836
	P- 9	18	21	11.073
	P- 97	19	10	11.745
	P- 11	20	12	12.731
	P- 62	21	19	13.466
	P- 73	22	26	13.973
	P-102	23	17	14.366
	P- 27	24	47	15.401
	P- 67	25	32	17.001
	P- 64	26	18	18.146
	P-120	27	13	20.625
	P- 40	28	39	28.024
	P- 87	29	47	30.704
	P- 71	30	38	37.768
	P- 32	31	40	37.894
	P-140	32	46	41.915
GROUP B	P- 22	1	2	2.717
	P-135	2	2	3.252
	P- 72	3	3	5.684
	P- 4	4	3	5.721
	P-133	5	4	5.947
	P- 58	6	4	6.036
	P- 60	7	5	6.986
	P- 68	8	6	7.894
	P- 70	9	5	8.733
	P-142	10	5	8.887
	P-143	11	6	11.371
	P- 2	12	10	13.280
	P-122	13	9	13.363
	P- 59	14	8	13.440
	P-128	15	10	13.813
	P- 15	16	9	14.898
	P- 45	17	9	15.042
	P-112	18	11	15.264
	P-107	19	13	16.289
	P- 26	20	11	16.444
	P- 3	21	13	18.668
	P- 16	22	11	19.184
	P-123	23	12	19.800
	P-137	24	12	22.023
	P-130	25	17	23.122
	P- 25	26	17	23.152
	P-124	27	16	25.336
	P- 82	28	20	30.490
	P-104	29	24	42.644

February report missing—covers seven months only: P-121, P-27, P-120, P-37, P-103, P-34, P-80, P-35, P-36, P-138, P-81, P-38, Bemis Bros. Bag Co.

	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP C	P- 55	2	1	2.268
	P- 89	3	2	5.735
	P- 43	4	2	6.549
	P- 88	5	4	9.612
	P-119	6	5	11.520
	P- 61	7	5	13.747
	P- 37	8	5	16.293
	P- 52	9	6	18.197
	P- 46	10	8	18.294
	P- 94	11	5	18.927
	P-113	12	6	19.416
	P- 47	13	7	25.073
	P- 29	14	8	25.672
	P- 33	15	10	29.646
	P-103	16	7	30.823
	P- 48	17	9	34.674
	P- 41	18	16	35.479
	P- 34	19	13	45.269
	P- 17	20	12	45.713
	P-111	21	16	46.388
	P- 80	22	16	61.308
GROUP D	P-129	8	1	5.639
	P-117	9	1	5.985
	P- 93	10	1	8.243
	P- 86	11	1	8.729
	P-141	12	1	10.264
	P- 35	13	1	10.540
	P- 50	14	3	15.740
	P-110	15	1	16.893
	P-125	16	2	18.073
	P- 91	17	4	18.958
	P- 36	18	3	20.619
	P- 6	19	4	20.960
	P-106	20	4	22.947
	P-134	21	4	23.048
	P- 99	22	3	24.955
	P- 49	23	4	24.978
	P- 14	24	6	25.188
	P-116	25	6	25.390
	P-138	26	4	26.071
	P- 7	27	5	26.288
	P- 63	28	5	26.642
	P- 42	29	4	27.675
	P- 98	30	4	29.270
	P- 65	31	3	30.048
	P- 81	32	5	30.703
	P- 38	33	3	39.042
	P-131	34	5	63.826

Division II—Paper and Board Re-Manufacturing

R-23	6	2	3.214
R-19	7	1	4.252
R-20	8	4	6.060
R-21	9	3	7.299
R-28	10	3	8.216
R-13	11	2	8.946
R-10	12	5	14.438
R-27	13	5	20.227
R-24	14	8	23.296
R- 1	15	10	25.389
R-11	16	2	25.433
R- 9	17	5	29.144
R-26	18	12	44.125
R- 4	19	6	81.564

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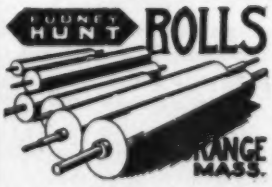

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◆ No Newsprint Produced by New Zealand Mills

There is no newsprint manufactured in New Zealand, at present, according to a recent survey. There are, however, four plants in New Zealand manufacturing wrapping papers, tissue papers, bags and envelopes. One type of locally produced common white wrapping paper is sold to some of the rural newsapers and they use it for printing purposes. This latter paper is not printed in rolls. It is not used to any great extent and is not classified as regular newsprint in the production statistics issued by the New Zealand Government.

It has been reported recently that a large mill located in the Auckland Province is commencing large scale operations by June, 1938, and it is further reported that this mill may undertake to produce newsprint at some future date. This new plant, located in North Island, is owned by Whakatene Paper Mills, Ltd., and is being erected at a cost of £500,000. It has not been definitely determined whether newsprint can be manufactured at a sufficiently low cost to warrant competition with the imported product.

Most of the newsprint consumed in New Zealand is, at present, imported from Canada. Ninety per cent of New Zealand's newsprint imports were supplied by Canada last year.

◆ Announce Tentative Program For Superintendents' Meet

Several members of the General Convention Committee for the 1938 Convention of the American Pulp and Paper Mill Superintendents Association met on March 19 at the Royal York Hotel, Toronto, Ontario, scene of the forthcoming Superintendent's Convention on June 22-24. The following committee chairmen were announced at this time: General Committee, B. D. Millidge; Ladies Committee, Mrs. R. W. Hynes; Reception Committee, C. E. Youngchild; Sports, J. B. Stephenson; Mill Visits, A. E. H. Fair and Boat, E. J. Thom.

The convention facilities of the hotel were thoroughly inspected and the entire Convention Committee expressed hearty approval of the excellent facilities available. All the Convention activities are to be held on the second floor of the hotel, which is the Convention Floor. This floor covers a total of 53,000 square feet and contains a large foyer, an exhibit hall, one large and two small meeting rooms and a convention or dining hall equipped with an organ, large stage and which has seating capacity of nearly 1,000. A separate kitchen for service to these rooms is located on this floor.

Mill visits will be urged on Monday and Tuesday, June 20 and 21, before the convention opens on June 22. Arrangements will be made so that superintendents can visit mills on the way to and from the convention rather than to take convention days for this. Without any solicitation to urge room reservations, over 350 people have reserved rooms while hotel suites are practically gone. Railroad officials are already working on groups for special cars. From all angles it would seem as though the 1938 Convention would be the largest ever held by the Superintendents Association.

The Hon. Mitchell Hepburn, Prime Minister of Ontario, has consented to be the guest speaker at the joint banquet on Friday evening. The toastmaster will be Harold Crabtree, president of Howard Smith Paper Mills, Ltd.

Tentative Mens Program

Activities at the Superintendents Convention have been tentatively arranged as follows:

All day Monday and on Tuesday morning, June 20 and 21, arrangements have been made for mill visits. On Tuesday afternoon supers will be given a chance to register and on the evening of the same day there will be an exhibitor's dinner.

During the morning of Wednesday, June 22, which is the first official day of the Convention, registration will take place followed by the general session. After luncheon the general session will be continued and in the evening there will be a boat trip on Lake Ontario.

Thursday morning, June 23, will be given over to the special group meetings and during the afternoon there will be a swimming exhibition at Sunnyside Park with facilities also available for golf, skeet shooting or other sports. There will be a smoker in the evening, with special entertainment, at the hotel.

On Friday the exhibits will occupy the morning hours while

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"WE need *dependable* speed reduction and gearing—can't take chances on production tieups in the paper industry. That's why, when it's a question of speed reduction or gearing, we stick to IXL—every time!"

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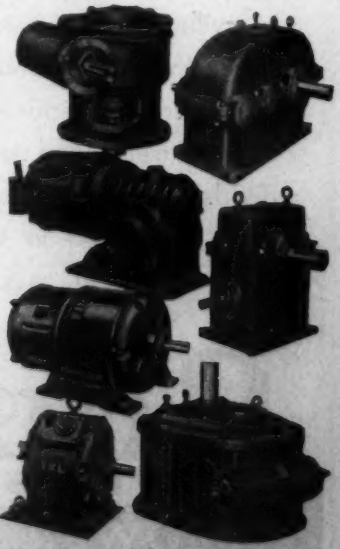

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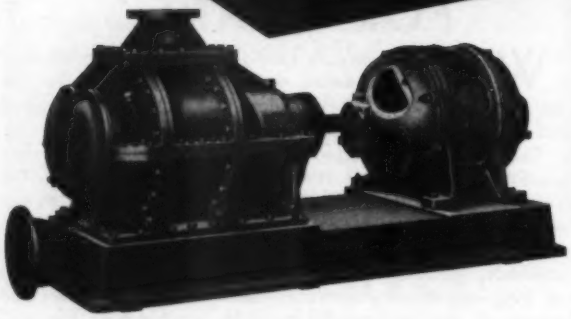

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the general session will continue throughout the afternoon. In the evening the joint banquet will be held at the Royal York, followed by presentation of the L. D. Post trophy, past president's jewel and entertainment and dancing.

Tentative Ladies Program

Tentative arrangements have also been made for the ladies attending the Superintendent's Meet.

Tuesday morning will be given over to registration and golf followed on Wednesday by a trip through T. Eaton Company stores, a musicale and a boat trip on Lake Ontario.

On Thursday the ladies will take a trip through the hotel and witness the swimming exhibition. Those who desire may play golf. In the evening a special ladies' dinner will be held at the Royal York, at which there will be special entertainment.

Friday morning will be given over to sightseeing and shopping, including a trip through Casa Loma and luncheon at Old Mill. Bridge will be played in the afternoon and the ladies will join the men at the joint banquet that evening.

◆ Southeastern TAPPI Members Plan Meeting

Members of the Technical Association located in the Southeastern States are planning an informal meeting in Savannah, Thursday, April 28. The meeting is to discuss the formation of a South Atlantic Section of TAPPI.

There are a hundred members of the Technical Association and as many more potential members engaged in pulp and paper work in the South Atlantic States. At present there is no Section of TAPPI the meetings of which can be attended conveniently by those located south of Virginia. Because of this isolation and because the Southern mills are practically all of the same type, it is felt that a local section of the Technical Association would serve to bring together technical men of similar interests to their mutual benefit both professionally and socially.

The preliminary gathering to discuss ways and means of initiating and supporting the local section has been scheduled for 2:30 P.M. Thursday, April 28, at the Hotel DeSoto, Savannah, Ga. A temporary organization to further the formation of the section will probably be set up at that time. It is expected that R. G. Macdonald, Secretary of the Technical Association, will be present. In addition to the informal business meeting a short technical program has been arranged. Papers on *"The Trend of the Southern Paper Industry"* and *"Wood Pulp for Chemical Uses"* will be presented. There will be no registration fee.

This gathering of TAPPI members and associates coincides with the Spring meeting in Savannah of the Electrochemical Society. The Electrochemical Society's Convention is from April 27 to April 30 at the Hotel DeSoto. Thursday morning, April 28, 9:00 A.M. to 12:00 M. the Electrochemical Society has scheduled a Technical Session dealing with electro- and physical chemistry in the pulp and paper industry. Bleaching of wood pulp, filling of paper and corrosion in sulphate mills will be discussed. Members of the Technical Association and others attending the TAPPI meeting are cordially invited by the Electrochemical Society to participate in this Technical Session. They are also invited to be present at the Thursday noon luncheon when D. H. Bissel will speak on "Chromium Plating for the Paper Industry." Registration fee of the Electrochemical Society meeting, necessary for the admittance to their functions, is $2.00. The Electrochemical Society will announce in a short time the complete program of its meeting.

The program for Thursday, April 28, of interest to the pulp and paper men is accordingly as follows:

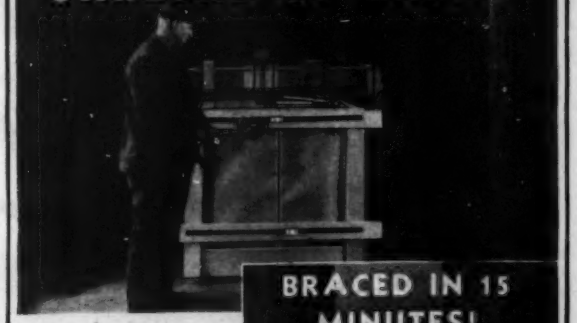
9:00 A.M.—12:00 M.—Technical Session (Electrochemical Society). Electro- and Physical Chemistry in the Pulp and Paper Industry. Papers on Bleaching, Filling, Corrosion, Cellulose Reactions, etc.

12:30 P.M.—Luncheon (Electrochemical Society). Speaker—D. H. Bissel: "Chrome Plating for the Paper Industry."

2:30 P.M.—Gathering of TAPPI members and associates in the Gold Room, Hotel DeSoto. Temporary organization to further the formation of a South Atlantic Section. Talks on "Trends of the Southern Paper Industry" and "Wood Pulp for Chemical Uses."

Hotel reservations should be made directly with the Savannah hotels.

CARLOAD OF PAPER



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POWER

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This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worthwhile practices suggest new ideas and wider usages of equipment.

By W. S. JOULE

◆ What Happens When Coal Burns?

When coal is first thrown upon a fire, the volatile matter is first liberated. This volatile matter consists of various gases and solids, commonly expressed as hydrocarbons. These hydrocarbons consist of two elements, carbon (C) and hydrogen (H), combined in varying proportions such as methane (CH_4), ethylene (C_2H_2), benzene (C_6H_6) and many others.

On the application of sufficient heat they are finally broken up into their constituent elements C and H. The carbon (C) combines with oxygen (O) in the atmosphere to form first CO, or carbon monoxide, which in burning takes up more O and becomes CO_2, or carbon dioxide.

The hydrogen (H) burns immediately to H_2O or water vapor. The fixed carbon, which together with ash (incombustible residue) forms coke, when it is heated to the ignition point passes through the same stages of CO and CO_2, as the carbon of the volatile matter, leaving a residue of incombustible ash composed of silica, alumina and other impurities. Now if combustion is complete after burning in just the correct quantity of air, all that will remain is CO_2, H_2O and nitrogen (N). This latter gas, forming practically four-fifths of the atmosphere by weight, is inert and incombustible and acts only as a dilutent.

If it were possible to proportion the air supply to the fuel correctly, the ultimate result in the flue gas would be CO_2 and H_2O vapor and nitrogen. The small proportion of sulphur burns to SO_2 and SO_3 (sulphur dioxide and trioxide), forming with the water, vapor, sulphurous and sulphuric acids. It is not possible, however, to obtain perfect combustion in actual practice owing to the difficulty of accurate regulation of the air supply.

◆ Commutator Sparking and Its Causes

Excessive sparking at the commutator is one of the most serious difficulties and perhaps the most persistent one encountered in operating direct-current electrical machinery; and due to the multitude of causes from which it may arise, it is often difficult to eliminate.

Among the more common conditions conducive to sparking may be enumerated the following:

(1) Overload; (2) Sudden changes in load; (3) Incorrect position of brushes, i.e., not set in exact neutral plane; (4) Unequal spacing of brushes; (5) Brushes not fitted exactly to the commutator; (6) Improper kind of brushes used; (7) Rough or pitted commutator; (8) Loose commutator bars; (9) High mica; (10) Insufficient brush pressure; (11) Oil or dust on the commutator; (12) Weak magnetic field; (13) Vibration of machine or ground; (14) Broken circuit or ground in the armature.

◆ AN INK THAT WILL WRITE on celluloid triangles or other instruments made of celluloid is anhydrous acetic acid. Writing done with this acid appears dull on the glossy surface. If it is wished to have the writing appear in color, the acid may be colored.

◆ WHAT EXTREME MEASURES SOME CRANE OPERATORS will take in order to abuse the equipment that is in their charge. Operators will tie up circuit breakers, wire around fuses, neglect oiling and allow sliprings and commutators to become so pitted and burned, that the motors will not run. They will plug the motors continually and will attempt to run motors which are connected mechanically in opposite directions. They will screw down bearing caps as tight as possible and then blame the motors for having no "Pep."

◆ IT SHOULD BE UNDERSTOOD that to obtain the greatest strength from an eyebolt, it must fit reasonably tight in the hole into which it is screwed and the pull applied in a line with the axis of the screw. Eyebolts should never be used if considered the least faulty. They should not be painted when used for miscellaneous lifting, as paint is likely to cover up flaws. They should be tested occasionally by tapping gently with a hammer while held in the hand. If it does not impart a good ring, it should not be used. Where a bolt is to be used for anything like its maximum load, it should be screwed in tight with a bar.

◆ Making Pipe Joints

To insure tight pipe joints take particular care in threading and also in making up.

All pipe stocks have marks indicating the set of dies for correct depth of thread for the size of pipe noted on the die or the face plate of the stock. These marks are intended to be used with the standard thickness of pipe but much more satisfactory threading can be done, even though a little more time is required, by taking two cuts instead of making the full depth of thread the first time over.

Should the work be such that extra heavy pipe is required, more than two cuts frequently will be required to make a satisfactory thread.

If care is taken in threading pipe there will not be much trouble experienced with leaking joints.

When pipe threads are cut properly and the joint made up right, there will be no need of any "dope" to produce a tight connection; it is good practice, however, to use some graphite compound on the thread for this will enable screwing to be done more easily and whenever it may be necessary to dismantle, the joints can be broken readily without much trouble.

◆ A BEARING SET UP TOO SLACK is nearly as bad as one too tight. Pounding will make a box run hot and is likely to peen the brass or babbitt and destroy the fit.

◆ Inspection of Coal Feeders

Two types of feeders are ordinarily used, the plate and steel apron. The plate feeder, though simple in design and rugged in construction, requires a small amount of care, or at least, a periodical inspection of the working parts. Coal dust should not be allowed to accumulate and pack on the roller runways, which is very likely to happen, if neglected, because of the common location of the feeder in a dust-filled pit. Do not use oil or grease on the runway as this only aids in the accumulation of dust. The babbitted eccentric straps with adjustable centers require lubricating, for which an occasional turn of the grease cup will suffice. If neglected and allowed to run hot, the babbitt may close up the grease passage and prevent future application of grease until opened.

Apron feeders require no more attention than the plate type. Care must be taken to see that the conveying unit is placed under enough tension by the takeups to eliminate practically all the slack. When carrying fine coal up steep inclines, there is sometimes considerable dribble which should be kept cleaned up and not allowed to accumulate, particularly under the chain and flights.

Le Blanc Forced by the French Tribunal to Make His Patent Public.

Through The Centuries With Alkalies

Nicholas Le Blanc is known as the father of modern soda manufacture. His invention was mothered by necessity, for he won a reward of 2400 livres offered by the French Academy of Science in 1775 when the Seven Years' War with England and the Napoleonic Wars throughout Europe shut off France's supply of Spanish barilla from which most soda was made at that time. The French Revolutionists robbed Le Blanc of the fruits of his invention and he died in 1806 a suicide in an almshouse. His process, however, was so nearly perfect that it endured with little change for over 50 years.

Splendid as Le Blanc's achievement was, the soda produced to meet today's exacting standards is of a quality undreamed of in that earlier era. COLUMBIA'S well-known reputation for setting these standards still higher, backed by its air-tight system of control, insures its customers a product second to none in quality . . . which includes purity, uniformity and whiteness.

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TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press.

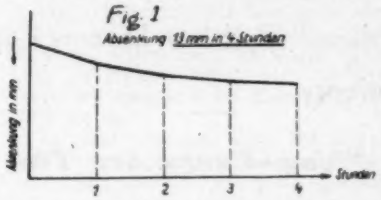
IN THE PAPER INDUSTRY

◆ Penetration and Sulphite Digestion of Wood

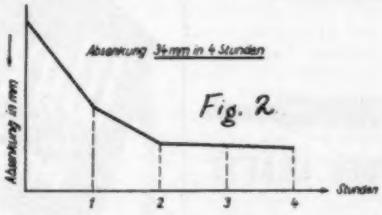
After discussing briefly the microstructure of wood, the author emphasizes the importance of the air, moisture content, and length of storage. The methods of determining the rate of penetration are also reviewed. For example, 11:5 kg. of wood chips were treated in an experimental digester with 70 kg. of cooking liquor containing 4.2 per cent SO_2 and 1 per cent CaO. The temperature was 25 deg. C., and the moisture content of the chips was 22 per cent. In Figure 1, a graphical presentation shows the rate of penetration. It indicates the lowering of the surface of liquid with time. In this instance, the drop (at atmospheric pressure) was 13 mm. in 4 hours. When the identical charge was treated under 6 atmospheres pressure, the results were much more marked (cf. Figure 2). Here the drop in surface level was 34 mm. (In these graphs Absenkung means lowering, and Stunden refers to hours.) The table given below shows the effect of high and low moisture content of wood in its effect on permeability of water, sulphite liquor, and other chemicals, as well as the penetration as affected by changes in liquor composition, etc. All experiments were carried out at 6 atmospheres pressure and at 25 deg. C., for 4 hour periods, at the end of which the drop in level was measured.

Moisture in Wood—Per Cent	Chemicals Used	Concentration	Drop in level (in mm.)
10.8	Water	....	32
7.6	Water	....	34
56.6	Water	....	18
18.5	Sulphite liquor	3.6% SO_2 1.3% CaO	30
20.4	Sulphite liquor	4.3% SO_2 1.0% CaO	33
23.0	Sulphite liquor	5.2% SO_2 1.0% CaO	42
22.6	Sulphite liquor	6.8% SO_2 1.0% CaO	58
57.2	Sulphite liquor	4.3% SO_2 1.0% CaO	17
24.1	SO_2 in H_2O	5.2%	41
21	HCl	3.0%	31
22.8	HCl	6.0%	32
20.8	NaOH	3.0%	24
21.9	NaOH	6.0%	26
23.7	NaCl	4.0%	32

Several facts are brought out in this tabulation. Green wood is less easily penetrated than is air dried wood. This is quite irrespective of whether water or sulphite liquor is used. When the CaO percentage is kept constant, in sulphite liquor, the penetration increases with rising SO_2 content. Evidently the effect of lime is negligible since the total penetration in the case of sulphurous acid (5.2 per cent SO_2) and sulphite liquor (5.2 per cent SO_2) is nearly the same.



Aqueous HCl and NaCl show the same degree of penetration as does water. However, NaOH probably due to swelling effects, shows a lower penetrability. In all cases, about 80 per cent of the final drop in level (penetration) was manifested at the end of the first hour. In the use of sulphite liquor, the physical condition of the components may be important. Clear (suspension- or emulsion-free) cooking liquors probably give the most efficient penetration. The fact that the solutions are found in the innermost portions of the chips (with NaCl solutions) was proved by the formation of AgCl precipitates.



The above experiments all deal with liquor (or liquid) penetration. In carrying out experimental digestions, the author used, at first the digester (100 l. capacity) referred to above. Chips (7.5 kg. with 28 per cent moisture content) were treated with a liquor (contg. 4.6 per cent SO_2 and 1 per cent CaO) in the cold for 1 hour, at 6 atm. press. The digestion was then made at 143 deg. C. for 13.5 hours. The pulp having a Roschier No. of 350 (i. e., a low Roe number) gave, after bleaching, 89.9 per cent alpha cellulose, and showed a relative viscosity of 28. In a control cook under identical conditions, except that pressure impregnation was omitted, a pulp was obtained which, on bleaching, contained 86 per cent alpha cellulose, and a relative viscosity of 20. The yields are not given but evidently penetration under pressure gave the best results. When a commercial cook was carried out in a digester (net volume 160 cubic meters) the chips were also subjected to 6 atm. pressure treatment prior to cooking. At the end of 1 hour, this pressure was lowered to 1.8 atm. In this way 20 per cent more of the sulphite cooking liquor could be introduced than in the case of the ordinary cook (in which no preliminary pressure impregnation had been used). The subsequent digestion varied somewhat from the common run of sulphite cooks, the rising temperature curves are different, so as to prevent mineralization in the cell walls (unfortunately, the author does not furnish details of these changed conditions).

At the end of 11.5 hours of cooking at 140 deg. C., the Roschier number of 27 samples of pulp remained practically unchanged (158-161). The Roschier No. gives the number of seconds required for 6 g. of moist pulp (2 g. dry pulp) to change the color of 80 cc. of audified 0.01N $KMnO_4$ from violet to yellow. The release of gas was automatically attained by using the electro-gas-relief valve of Pfotger. By connection with a contact manometer, the valve may be regulated to cause gas relief at any desired pressures (within 0.1 atm.). It is necessary to avoid stratification into liquors of varying density within the digester. These lead to a non-homogeneous pulp. (i.e., one with varying Roschier numbers). Another cause of non-homogeneity is the use of chips that are not uniform in their moisture content. Here attempts to attain easy bleaching pulp (Roschier No. about 126) led to marked variations. However, if the digestion is carried out with a view towards hard pulps (Roschier No. 23) no such difficulty arises. The relationship between the morphological wood structure and the cause of the digestion is evidently of marked technological importance. Otto Wurz. Papier-Fabr. 35 (Tagungs- u Auslandsheft 1937) 481-5.

◆ Available Surface of Cellulose

Filter paper made from cotton cellulose was impregnated with cobaltic chloride solutions of various concentrations under standardized conditions. The solutions varied from 0.05N (through various ranges) up to 2N. A paper having an area of 10 sq. in. was weighed and impregnated with 1.5cc of solution. It was then dried, and absorption spectra were taken for lines 6850, 6660, 6250, 6100, and 5250 O, all

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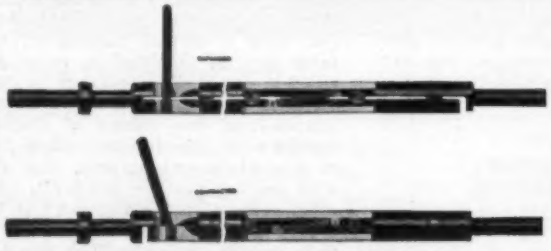

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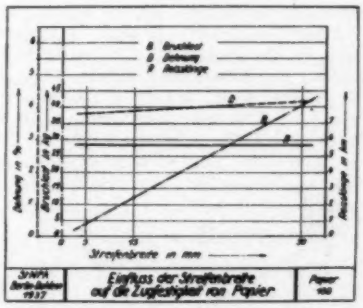
of which showed a sharp uniform increase of extinction coefficients until 0.24N cobaltic chloride was reached. The assumption was made that at this point the true cellulose surface had been uniformly coated with a unimolecular layer of cobaltic chloride molecules, the number of which could be calculated. From these the surface area of cellulose available for adsorption was computed. It was found to be 1.36 x 10^5 sq. cm. per gram. While microscopic studies of fiber dimensions indicated only 1.6 x 10^3 sq. cm. per gram. The adsorption data then lead to an available (i. e., true) surface area per unit weight 85 times as great as that indicated by the microscope. The number of molecules of cobaltic chloride adsorbed per g. of cellulose was about ten times as great as the number of molecules of vat dye adsorbed. O. R. Howell and A. Jackson. J. Chem. Society (of London) 1938, 979-82, through Papier-Fabr. 35 (Abstracts) 189 (1937) and C. A. 31, 8181 (1937).

◆ Standardized German Testing Methods

In an illustrated address, the author gives in detail the development of methods used by the D. V. M. (the German Association for Testing Industrial Materials) in paper testing. He discusses the determination of weight per square meter, thickness, weight per unit volume, and the marked effects of the area and dimensions of the sample strip, the relative humidity, the temperature, and



the actual rate of testing on the tensile strength, bursting strength, and folding endurance of a specific paper. These factors are illustrated graphically, and one such graph is included herewith. This shows the influence of width of the sample strip (Einfluss der Streifenbreite) on breaking load B (Bruchlast), stretch, D (Dehnung) and breaking length R (Reisslange). The Mullen and Schopper-Dalen testers are also critically compared. Dr.-Ing. Korn. Papier-Fabr. 36 (Tech. T1). 21-4, 29-32 (1938); Wochbl. Papierfbr. 69 (Tech. Tl.) 29-32, 72-5 (1938).

◆ Red Rot in Spruce Wood

Previous work by Falck and his associates (Ber. 60, 225 (1927); 61,2101 (1928)) which indicates that heart (or red) rot caused by *Polyporus annosus* first destroys the lignin of the wood, has not been confirmed by the present author. Sound spruce wood, usually varying in density between 0.4 g/cc. and 0.5 g/cc. showed a very marked loss in weight per unit volume as decay progressed. However, individual samples remained within the lower limits for sound wood. Solubility in alkali seems to be the best criterion for decay, 15 per cent aqueous NaOH being used. The solubility for samples of sound wood varied from 13.8-14.8 per cent while decayed wood samples (depending on the extent of decay) varied in solubility from 19.4-57.3 per cent. In general, an increase in solubility is correlated with a decrease in density. Strangely enough, at no point in the decay does the wood show very marked differences in per cent C and H or in chemical composition. For example, a sound wood contained 31 per cent lignin and 56.9 per cent cellulose, while a highly decayed sample yielded 28.1 per cent lignin and 52.7 per cent cellulose. These are the extreme differences. The sound wood had an alkali solubility of 14.5 per cent, the decayed wood a solubility of 57.3 per cent.

In other instances, where the decay was less marked, the respective cellulose and lignin figures for sound and decayed wood were almost identical. While it is qualitatively true (as suggested by Falck and Haag) that progressive heart rot yields a lignin that becomes more soluble in concentrated H_2SO_4, the solubility differences are relatively slight. After alkaline treatment of rotted wood, the percentage lignin in the residues (as compared with the initial sample) may increase slightly or decrease slightly, depending on conditions. Where the decay has resulted under natural conditions, there is ordinarily an increase; where it has occurred in blocks floated on a malt-agar culture medium of *Polyporus annosus*, there was a slight decrease. The latter may be due to the presence of a nutrient medium rich in carbohydrates. The cellulose content of wood was determined by two methods: (1) the chlorine and ammonia method of Lüdtke, and (2) the HNO_3 and alcohol method of Kürschner. The results were always in excellent agreement, but it is evident that the determination yields some hemicelluloses as well as cellulose. When the "cellulose" residues were treated at room temperature with 7 per cent NaOH and 3 per cent NaCl solution, the hemicelluloses were largely removed. Under such conditions, sound wood gave 50.2 per cent cellulose and a highly decayed wood 44.7 per cent cellulose. In the more advanced stages of decay, the ratio between cellulose and non-cellulosic polysaccharides changes. When soda cooks were made on sound and decayed wood, the pulp yields decreased with progressive decay, and the alpha-cellulose content of the pulp also decreased.

Although it was impossible to remove the mycellium of *Polyporus annosus* from decayed wood, a special analytical study of the mycellium grown in culture media was made. This indicated that the presence of mycellium probably has little effect on lignin determinations

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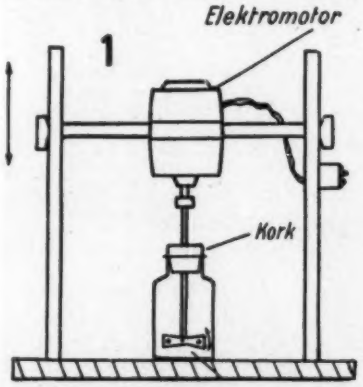
of unextracted decayed wood, and that the cellulose determinations may be slightly low. The alcohol extractives in mycellium material was 24 per cent as compared with 2 per cent in sound wood. Possibly the resin-fat content increases with progressive decay. An explanation of what may take place during the heart-rotting of wood may perhaps be found in Staudinger's hypothesis that the macromolecules of the components have been split into smaller molecules. This accounts for increased alkali solubility, but it is difficult to fully explain the approximately unchanged ratio between lignin and the polysaccharides during decay. There may be a loose compound formation between these components. At least the author advances this hypothesis with reservations. Numerous references are given to the recent literature. The experimental techniques are fully described and complete tabulated data are given. The results are based on the work of M. Schmidt and H. J. Haggeney. The article is by K. Storch. Papier-Fabr. 35 (Tagungs- u Auslandsheft) 485-92 (1937).

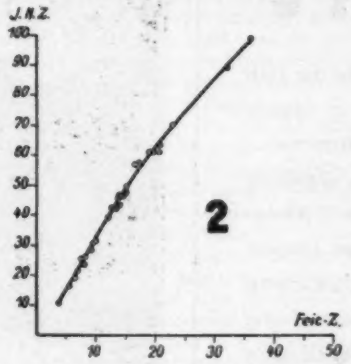
◆ Degree of Pulping; the Ferricyanide Number

The direct potentiometric determination of lignin by potassium ferricyanide did not prove feasible. However, the following visual titration method was developed; 2 grams of oven dried pulp (or its equivalent) was softened by standing in contact with water and then defibrated into a homogeneous suspension in the apparatus shown in Figure 1. This is filtered and treated with 65 cc. of a solution (made by mixing 155 cc. 4 per cent NaOH and 130 cc. 10 per cent $K_3Fe(CN)_6$ and diluting to 1 liter). The treatment is carried out at 20° C. for 1 hour. Thereupon the mixture is filtered and the pulp is washed until the last runnings are colorless, but the volume of the filtrate

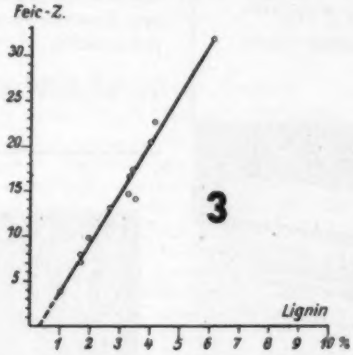


is not allowed to exceed approximately 200 cc. To this filtrate are then added 10 cc. 20 per cent H_2SO_4 and the solution is titrated with 0.05 *N* $KMnO_4$ with ferrous sulphate as indicator. Using the same reagents in the absence of pulp, a control titration always showed a slight blank (about 0.3 cc.). The difference between this and the determination, i. e., the actual number of cc. $KMnO_4$ consumed is termed the ferricyanide number Feic No.)

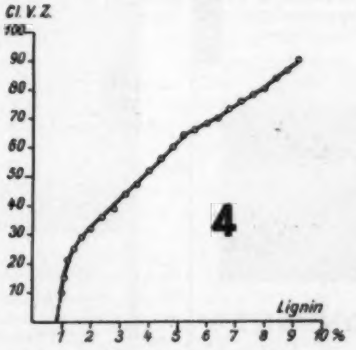
The author gives the effect of time, temperature, alkali concentration and $K_3Fe(CN)_6$, and the state of division of the pulp sample, on the results of



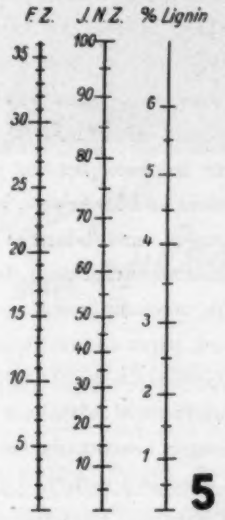
the Feic No. He has also compared and correlated the results of a long series of determinations, with pulps containing varying amounts of lignin, with the Johnsen-Noll number, the Sieber (chlorine consumption) number, and



with the amine number. The lignin was determined by the standard procedure given in Merkblatt No. 3, of the German Fiber analysis committee appointed by the Association of Pulp and Paper Chemists and Engineers. The



results of these correlations are shown in the accompanying graphs. Figure 2 shows the Feic No. plotted against the Johnsen-Noll No. Figure 3 shows the Feic No. plotted against the lignin content. Figure 4 shows the Seiber No. plotted against the lignin content. And finally, Figure 5 gives a useful scale showing the relationship between Feic No., Johnsen-Noll No., and per cent lignin. However, there were wide fluctuations in Nippe's so-called "amine" numbers [cf. THE PAPER INDUSTRY, (1937) 1185-7] which was not brought into harmony with the Feic No. It was shown, however, that the determina-



tion of the amine number could be simplified by potentiometric titration with $NaNO_3$. The ease of reproducibility of the Feic No., and the relatively small variations in duplicate determinations, together with the simplicity of carrying it out recommend it over most of the methods for determining lignin now in use. The author gives 30 references to recent literature. Kurt Schwabe and Heinz Fiedler. Wochbl. Papierfabr. 68 (Tech. Tl.) 912-6, 1002-4, 1024-7 (1937); 69 (Tech. Tl.) 5-7, 51-3 (1938).

◆ Flax Chaff in Pulp Manufacture

The hope of using the 38 per cent flax chaff, which is a waste product in obtaining flax for paper making pulp is a rather dim one, as indicated by these experiments. The raw material comprises 152,000 tons per annum in Germany. A sharp distinction must be made between flax straw containing bast fibers and the flax chaff. In the former case, the flax plant is used in linseed oil production, and the straw is the waste product, while in the latter case the plant is used as a textile fiber, retting occurs and the chaff is one of the waste products. Analysis of Stockheim flax chaff *(I)* was analyzed and compared with the bast fibers *(II)*. The differences are striking. *I* showed 29.6 per cent lignin, and 24.4 per cent pentosans. *II* showed 8.6 per cent lignin and 5.0 per cent pentosans. Similar differences were noted in American linseed oil straw chaff and bast. *I* is an unusually heterogeneous product. Prior to any chemical treatment, about 12 per

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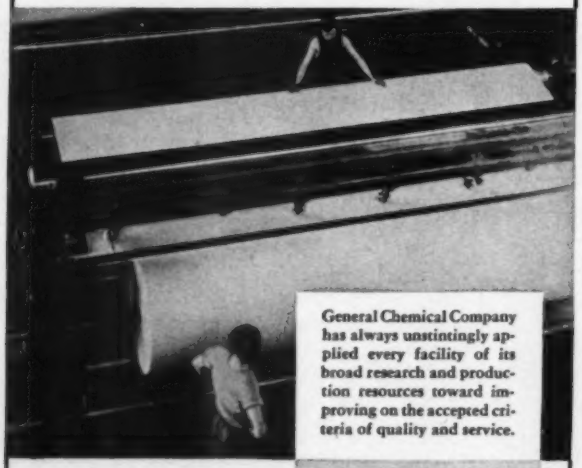

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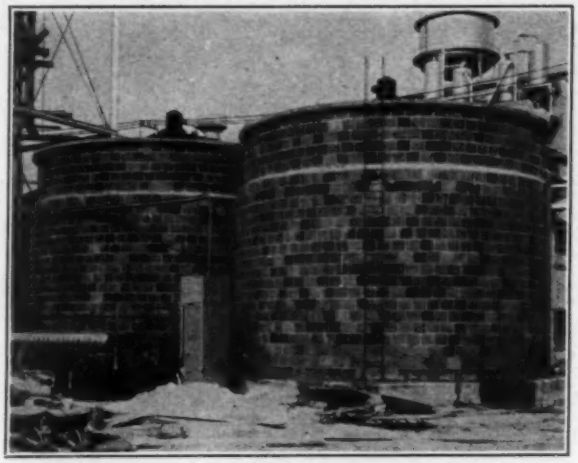

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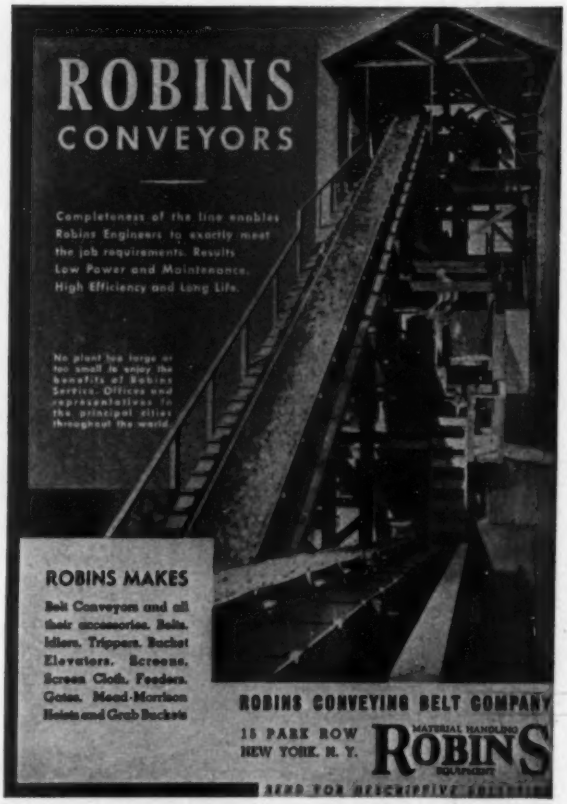
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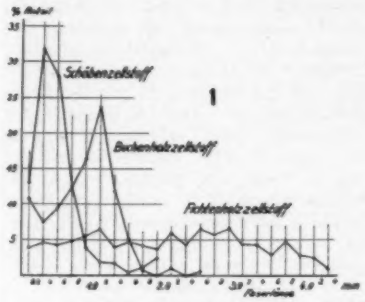
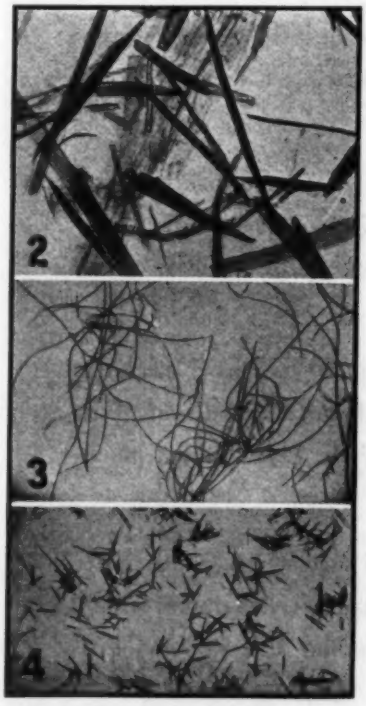
cent of dust must be screened out of the remaining portion, the larger fragments, which contain bast fiber particles (provided these are not present in too large an amount) may be treated with the chaff. Using a screened chaff representing about 50 per cent of the original material (which passed a 4 mm. and 2 mm. sieve, but which was retained by a 1 mm. sieve) a sulphite cook gave



a dirty, and valueless pulp. When the same fraction was delignified in a sulphate digestion, the resulting pulp had properties resembling ordinary straw pulps, and beechwood sulphite pulps. However, the pulp was distinctly inferior to beechwood sulphate pulp. A series of sulphate cooks indicated that the best concentration of alkali (calculated as Na) was 3 per cent (in a mix-



ture of 65 per cent NaOH, 15 per cent Na_2S and 20 per cent Na_2CO_3). The liquor ratio was 9.1, the digestion period 2 hrs. and the temp. 170 deg. C. A three-stage bleach (chlorine—followed by 1 per cent alkali, followed by NaClO) yielded a pulp comparable in properties with those of bleached straw pulp. Its alpha-cellulose content was 81.3 per cent and the yield (of bleached) pulp only 33 per cent. Further purification with 5 per cent NaOH raised the alpha cellulose content to 89.9 per cent, which then falls in the range of untreated rayon spruce sulphite pulps, although the viscosity is somewhat lower than with other rayon pulps. The yield was 31 per cent. A great increase in alpha cellulose (to 98) per cent was obtained when cold 10 per cent NaOH was used.

It is evident that due to the high percentage of short fibers in chaff pulp, its use in papermaking is extremely limited. The cost of producing a pulp suited to rayon manufacture seems prohibitive at present, especially since the yields are low. Figure I shows the frequency of fiber lengths in chaff pulp (Schabenzellstoff), beechwood pulp (Buchenholzzellstoff), and spruce wood pulp (Fichtenholz zellstoff). Thus, it is evident that the fiber of chaff is ultra short. The heterogeneity of chaff pulp may be gaged from Figure II (X 95 diams.). If screening is not resorted to, prior to delignification, long thin bast fibers (as shown in Figure III (11 diams.)) are admixed with the short chaff fibers, Figure IV (11 diams.). G. Jayme, H. Pfretzschner and J. Ditz. Papier-Fabr. 36, (Tech. Tl.) 46-55 (1938).

◆ Mechanical Pulp Treated with Ethyl Mercuric Chloride

Ethyl mercuric chloride (ordinarily termed lignasan) gives good results in combatting blue stain in wood bolts, and hence a laboratory study was undertaken in an effort to inhibit fungal attack in groundwood pulp. The effects of length of treatment and temperature were investigated. Lignasan kills diaspores of blue stain very rapidly. In concentrations of 0.005 per cent of lignasan, the stock is sterile within 5 minutes, and dilution of the spores with a fiber suspension of the same concentrations as those found in the waste waters in mill practice did not alter the effectiveness of lignasan toxicity. As the spore concentration increases, the poison is less effective. The fungus *cladosporium herbarium* (which is less widely distributed in mechanical pulp than is *Pullularia pullulans*) is also more resistant than is the latter. With increasing temperature, the spore resistance towards lignasan decreases. Unfortunately, the satisfactory laboratory experiments could not be carried over into mill practice. While there was very definitely a decrease in the number of spores, the stock could not be rendered sterile, even when powdered lignasan was added to the stuff. Lignasan causes no odor or coloration in the pulp. The author ascribes the failure of the application of lignasan in practice to uneven distribution in the stock. Furthermore, whether the use of the toxic agent could be made profitable commercially is still a moot question. E. Rennerfelt. Svensk Pappersmasse-Tidn. 14, 506-508 (1937); through Papier-Fabr. 36 (Abstracts), 27 (1938).

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Inquiries with reference to any of these patents should be addressed to James Atkins, Munsey Building, Washington, D. C.

Compiled by James Atkins, Registered Patent Attorney

20,667—Art of Ply Paper or Board Manufacture. John W. Sale, Hopewell, Va., assignor to Hummel-Ross Fibre Corporation, Hopewell, Va., a corporation of Virginia. Original No. 2,018,382, dated October 22, 1935, Serial No. 749,839, October 24, 1934. Application for reissue August 18, 1937, Serial No. 159,768. 13 Claims. (Cl. 92—39). In the art of making ply paper or ply board or products of a similar nature on a single Fourdrinier wire, continuously applying a dilute suspension of fibrous stock on the wire and continuously moving the same with the wire, while dehydrating the same by quickly extracting a sufficient quantity of water therefrom to form a fibrous base sheet by setting the fibers in the underside of the base sheet and leaving the upperside of the sheet in a watery condition such as will enable it to commingle with a stock applied thereover, said dehydration including conveying the wire-supported stock over table rolls and then applying suction to the base sheet, continuously delivering onto the top side of said formed dehydrated base sheet at a point substantially immediately after said suction is applied to the sheet and as the latter travels a dilute stream of stock and at a point where said base sheet has its upper or top side in such watery condition as to enable the water and fibers on the upper surface of the base sheet to commingle with the water and fibers of the second applied stock and without disturbing the initial set of the fibers in the underside of the base sheet, dehydrating the composite sheet with sufficient rapidity after delivery of the dilute stream upon the base sheet to avoid a rippled finished sheet and causing the fibers of the adjacent surfaces of the respective stocks to intermingle and interlock by drawing down the fibers of the under part of the second applied stock into interlocking mixed relation with the fibers of the upper portion of the base sheet and thus form a sheet which is homogeneous and not subject to peeling and in which the fibers of the two stocks are interlocked within the body of the sheet.

2,106,709—Paper and Process for the Manufacture of Paper. Webster E. Byron, Lock Haven, Pa. Application April 4, 1933, Serial No. 664,347. Renewed April 20, 1937. 3 Claims. (Cl. 91—68). The improvement in the art of paper manufacture which comprises applying to the surface of paper an aqueous suspension of starch and finely divided water-insoluble inorganic material, said suspension containing starch to the extent of not exceeding 5% of the starch and water present, said water-insoluble, inorganic material being present in amount not exceeding the amount of starch present, thereafter drying and thereafter calendering the said sheet.

2,107,343—Process of Treating Paper. Chester D. Rockwood and Kenneth L. Osmun, Cincinnati, Ohio, assignors to The Union Selling Company, Cincinnati, Ohio, a corporation of Ohio. Application April 14, 1936, Serial No. 74,341. 5 Claims. (Cl. 8—20). A method of treating paper stock to produce a parchment-like effect which comprises conducting said stock through a bath of a solution of commercial grade zinc chloride in commercial forty per cent grade formaldehyde, said solution being prepared by dissolving the zinc chloride in the formaldehyde solution.

2,108,231—Method of Making Paper. William C. Nash, Neenah, Wis. Application March 14, 1935, Serial No. 10,990. 2 Claims. (Cl. 92—39). In a process wherein a pulp comprising, kapok fibers and fibers having the characteristics of felting into relatively strong structure is deposited upon a continuously moving foraminated surface to form a composite mat having a lower relatively thick layer of kapok fibers and an upper relatively thin layer of said other fibers, the improvement which comprises, depositing a fibrous pulp comprising fibers having characteristics of felting into a relatively strong structure upon a rotating foraminated surface to form a mat upon said surface, and bonding said mat upon the upper surface of said first mentioned kapok fiber mat under substantially constant pressure, said pressure being self-variable in direct relation to the variations in the aggregate thickness of said composite mat.

2,109,944—Paper Sizing. Louis Leonard Larson, Wilmington, Del., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware. Application August 28, 1935, Serial No. 38,327. 2 Claims. (Cl. 92—21). A process for manufacturing sized calcium carbonate filled paper which comprises preparing a solution in volatile organic solvent of oil-plasticized resin, emulsifying the solution of the plasticized resin with water and an emulsifying agent, homogenizing the emulsion until the plasticized resin is contained therein in the finely divided state obtainable by homogenization in a colloid mill, adding the emulsion thus prepared to a water slurry of calcium carbonate, precipitating the plasticized resin on the calcium carbonate, mixing the sized calcium carbonate with unsized paper making fibers, and making the mixture of said calcium carbonate and unsized pulp into paper.

2,109,647—Apparatus for Coating Surfaces. Mortimer S. North, Evanston, Ill. Application November 6, 1935, Serial No. 48,459. 17 Claims. (Cl. 91—18). In apparatus for giving paper or other sheet material a coating of viscous liquid material, the combination of means for supporting the paper or other sheet material, in a manner to resist pressure exerted against the paper, and means including a screen uniformly engaging the surface of the paper or other material, for applying the liquid material under pressure to the surface of the paper or other sheet material, the means for applying the liquid material comprising a fountain supply having a rotating feed roller for feeding and pressing the liquid material through said screen upon the surface of the paper or other sheet material.

2,109,931—Paper Sizing. James Carl Schmidt, Collingswood, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware. Application August 28, 1935, Serial No. 38,329. 11 Claims. (Cl. 92—21). In a process for manufacturing sized paper having an alkaline filler, the steps comprising precipitating size on paper pulp with an acidic precipitant, then neutralizing the acidity of the sized pulp with dilute alkali which does not liberate carbon dioxide, and then mixing the pulp with a water slurry of the alkaline filler treated with size comprising plasticized resin insensitive to the alkalinity of the filler.

2,111,089—Paper Manufacture. Henry P. Carruth, Chillicothe, Ohio, assignor, by mesne assignments, to K. C. M. Company, Dayton, Ohio, a corporation of Delaware. Application December 18, 1933, Serial No. 702,838. 14 Claims. (Cl. 92—40). As a product of manufacture, a sheet of paper having a body portion comprising a web of fibrous material substantially free of or deficient in filler, and having upon one surface thereof a light weight coating of finely divided mineral material, said coating penetrating in decreasing proportion into the body portion of the web from said surface, the opposite surface being substantially free of said finely divided mineral material, and said sheet having the characteristics of having the finely divided mineral material incorporated thereupon while wet and on the wire side thereof.

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The COMMERCIAL OUTLOOK

New York, April 1, 1938.

WHAT is the immediate outlook for business in general and the paper industry in particular is indeed a moot question. The degree of uncertainty now existing perhaps never before has been equaled. Developments recently have been of a most unfavorable and disconcerting character. The decline in commodity and security values has been severe; business has shrunk in practically all quarters to a pronounced extent; the recession has become more accentuated rather than giving signs of impending improvement. Sentiment, it may be said, is not shaken, but shattered, and very much so.

Opinion in business and manufacturing circles is veering to the belief that relief from the present distressing condition hardly will be seen before the fall of the year. Most business men and manufacturers have about become reconciled that a long and tough spring and summer are to be experienced. Many hold to the hope that the Federal Government will take a hand in the situation and in the near future put forth sincere efforts to buoy up sentiment by giving reassurance to business that it will cooperate with rather than antagonize business. Some feel the Government will be obliged to step in and start a new priming campaign to help industry and business out of the present lethargic situation.

That the paper manufacturing industry is in a more favorable position than numerous other industries is indicated by the production ratio report which shows that during February a ratio average of 68.9 per cent was recorded, representing a distinct gain from the December figure of 54.5 per cent. Even additional improvement to 71.1 per cent was registered during the week ended March 12, yet on the other hand, a drop to 67.6 per cent was shown in the following week ended March 19, which was below the February average. Ordinarily at this time or just prior to the busy Easter and spring shopping period, paper manufacturing shows an appreciable increase, and the fact that the last issued figure is a decline from recent previous weeks indicates that the industry is feeling the efforts of the further slump in general business.

Production of newsprint in North America during February declined 89,184 tons or 23.7 per cent from the production in the same month of 1937, according to News Print Service Bureau figures. Canadian mills produced 202,601 tons in February, compared with 275,532 tons a year ago, while mills in the United States had a total production of 61,357 tons, against 72,072 tons in February, 1937. This was a decrease of 26.5 per cent in Canada and 14.9 per cent in the United States contrasted with last year. Aggregate North American newsprint output reached 286,530 tons in February, compared with 375,714 tons in corresponding 1937 month, a drop of 23.7 per cent.

Despite the lower rate of production in February last, shipments were again well behind the month's output, with the result that stocks at mills in the United States and Canada rose to 170,890 tons at the end of February, against 132,318 tons a month previously, and 89,764 tons on February 28, 1937. Canadian mills shipped 162,906 tons in February and United States mills 62,480 tons.

Production during the first two months of this year amounted to 425,101 tons in Canada, a decline of 138,122 tons or 24.5 per cent compared with the same period last year, and 133,871 tons in the United States, a decrease of 18,206 tons or 12.0 per cent from a year ago. North American output was 604,396 tons in the two-month period this year, against 771,564 tons last year, a drop of 167,168 tons or 21.7 per cent.

A favorable feature in the newsprint statistics, however, is that although the use of print paper by American newspaper publishers in February showed a decline of 10.9 per cent as compared with February, 1937, stocks of newsprint held by 431 newspapers continued to decrease from the high level reached at the end of 1937. On December 31, total newsprint stocks of the American newspapers were 613,406 tons; by the end of January they dropped to 559,882 tons, and at the end of February they were down to 503,661 tons. This means that publishers consumed a great deal more paper in the first two months of the current year than they absorbed, thus accounting in some measure for the sharp decrease in newsprint production in that period. Stocks on hand at the close of February last were equal to 67 days' supply at the February consumption rate, against 75 days' supply a month earlier. Publishers had on hand on February 1, 1938, a total of 521,414 tons of newsprint. During the month they received 154,276 tons and used 210,120 tons. A total of 879 tons were sold to leave stocks on hand at the end of the month of 464,691 tons. There were in transit to publishers 38,970 tons, to make total stocks on hand and in transit 503,661 tons on February 28, 1938.

Mills in the United States produced a total of 263,729 tons of paperboard in January last, according to the Census Bureau's monthly summary, representing an appreciable rise over 239,093 tons in the month preceding but a sharp decline compared with 365,665 tons in January last year. Board output was at 54.5 per cent of mills' rated capacity in January, against 47.8 per cent in December last and 82.0 per cent in January, 1937. New orders received by manufacturers called for a total of 265,029 tons of board in January, compared with 237,701 tons in the month before and 407,716 tons in the same 1937 month. Unfilled orders held by mills at the end of January were for an aggregate of 78,085 tons, contrasted with 74,484 tons a month previously and 221,409 tons on the similar date in 1937.

Shipments of prepared roofing from producing plants in the United States in January amounted to 1,831,858 squares, showing a good increase over 1,098,235 squares shipped in the preceding month, but falling below the 2,386,223 squares in the same month last year, according to the report issued by the Census Bureau.

◆ ◆

◆ E. M. Paukert Has New Post at Iroquois Falls

Manager of the Fort William Division of the Abitibi Power and Paper Company, E. M. Paukert has been promoted to the managership of the Iroquois Falls Division of the company. W. J. Olson, formerly general superintendent at Sault Ste. Marie, succeeds Mr. Paukert at Fort William. Mr. Paukert has been manager of the Fort William Division since it re-opened and on his departure was presented with a gold wrist watch by his many friends there.

◆ British Interests Plan Mill for British Columbia

Nootka Wood Products, Ltd., of Vancouver, is now negotiating for the establishment of a 200-ton pulp mill at Vancouver Island, B. C., it was learned recently. The same British interests who back the saw mill established by this company in the same locality are now interested in the pulp project and A. E. McMaster, managing director of the Nootka organization, has gone to England to clear up details. It is expected that the planned sulphite mill will be started before the end of the year.

◆ ALL DIRECTORS OF THE Hercules Powder Company were re-elected for the coming year at the annual stockholders meeting held recently. The re-elected directorate includes R. H. Dunham, T. W. Bacchus and C. D. Prickett, who have served continuously on the board since the company was organized twenty-five years ago.

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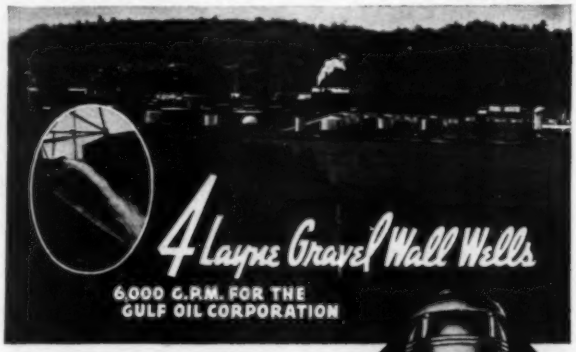

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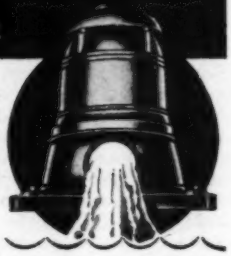

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Domestic RAW MATERIALS

◆ Old Paper

The waste paper condition appears to be going from bad to worse. With paper and board mills heavily stocked and out of a mood to add to their supplies, demand is of very slim dimensions and altogether insufficient to absorb the material offered notwithstanding that collections have been curtailed drastically in numerous production centers. It is a fact that packers are being forced to the wall by the extremely low market prices prevailing, more especially on the low bulky grades like mixed paper, corrugated boxes and folded newspapers, and yet the substantial decrease in the supply reaching the market fails to have helpful influence.

No. 1 mixed paper is down to $2 a ton in the East f.o.b. New York, and probably lower. As a matter of fact, dealers in instances are attempting to give mixed paper to buyers for nothing, in order to get it off their hands. Folded news is 25 cents a hundred pounds in the East f.o.b. shipping points, old corrugated boxes 25 cents a hundred pounds, No. 1 heavy books and magazines 50 cents per hundred, old kraft paper 55 to 60 cents, colored ledgers 65 to 70 cents, and white news cuttings 1.25 cents a pound. Hard white envelope cuttings are quoted at 2.25 to 2.35 cents a pound at dealers' points, hard white shavings at 1.75 to 2.25 cents, according to quality, and soft white shavings on a range of 1.60 to 1.75 cents for ordinary up to 2.25 cents for one-cut grade.

◆ Pulpwood

There is limited demand currently for pulpwood and such market activity as there is has to do with deliveries against contracts or old orders. Quoted rates hold to about previous levels.

◆ Mechanical Pulp

Mechanical pulp quotations are ruling more or less stationary, and since there are very few current sales recorded, the prices asked by would-be sellers constitute virtually the only levels the market possesses. Whether these prices could be shaved is a question, but the condition of the market is such as to imply that buyers doubtless could operate at lower levels if they tried. Domestic and Canadian producers continue to quote around $35 per ton for moist groundwood delivered at consuming mills in northern sections of the United States. Other asking prices include $30 a ton ex dock American Atlantic ports for Canadian groundwood brought down by boats for consuming mills near the Atlantic seaboard, $31 to $32 a ton for Scandinavian dry and $32 to $34 for moist groundwood ex dock American Atlantic ports.

◆ Chemical Pulp

Practically all domestic and Canadian pulp manufacturers have reaffirmed their quotations on chemical wood pulp to contract customers during the second quarter on the same bases as prevailed the first three months of the current year. This means that domestic bleached sulphite will remain on a basis of 3 to 3.20 cents a pound, and unbleached sulphite 2.50 to 2.60 cents ex dock Atlantic seaboard and bleached soda pulp 2.90 cents delivered consuming mills during the second quarter period to contract customers. In maintaining these contract levels, domestic pulp producers are lending their best efforts toward a stabilization of pulp prices.

There is a lack of worthwhile demand for chemical pulp. Most consumers are more concerned with reducing their stocks than in adding to them, as has been their attitude for some months. At best, only spasmodic sales are being registered, and in many cases the pulp involved in these transactions is resale pulp. Domestic kraft of southern origin is offered freely at 2.37½ cents a pound delivered consuming points, and reports have it that purchases have been effected at below this price. Northern kraft is quoted at 2.75 to 3 cents at pulp mills, with very little selling except to contract customers. It is no secret that a majority of domestic pulp manufacturers are in want of orders.

◆ Chemicals

While there is a moderate movement of papermaking chemicals against contracts, open-market demand is slow indeed. Quoted prices are fairly well sustained as producers are not exerting pressure to effect sales in an unwilling market. Caustic soda is around 2.20 cents a pound for the solid product f.o.b. works, and soda ash 1.05 cents in bags at works.

◆ Papermaking Rags

To say that markets for papermaking raw materials are quiet is stating the case ultra-reservedly. Without one iota of exaggeration, it can be said that demand is nearly nonexistant. Consuming mills, with a few exceptions perhaps, have all the stocks on hand their current requirements call for, and are plainly opposed to adding to their inventories. Rather, every effort is being made to reduce raw material holdings, irrespective of present market prices and other prevailing circumstances.

Aside from occasional transactions usually involving small quantities of standard grades, papermaking rags are in a lifeless market condition. Prices are entirely in favor of manufacturers, yet the seemingly attractive quotations named in selling quarters fail to attract paper mill buyers into the market, unless of course they have definite needs to satisfy. Dealers and importers stress that low market values and slow demand have served to curtail domestic collections as well as importations, and that available supplies are actually shrinking instead of increasing. They endeavor to impress upon mill customers that now is a favorable time to buy and lay in stocks, while prices are easy and few purchasers are operating in the market. Their efforts in this direction nevertheless are resulting in no improvement in demand. Matters are close to a standstill, and quoted levels are gradually moving downward.

Export demand has dwindled, which is another factor adding to the market's dullness. Dealers appear reconciled that about the only hope of the situation is a revival of consuming call for rags, and have adopted—doubtless having been more or less compelled to—a waiting policy, feeling that sooner or later buyers will be obliged of necessity to expand their operations in the market

New cutting prices are gradually yet nevertheless persistently seeking cheaper levels. The white grades show relatively more steadiness than the colored cuttings; the reason for this is that the market is proportionately clearer of accumulations of white stock. Dealers ask 7 cents or higher per pound for No. 1 new white shirt cuttings f.o.b. shipping points, contending that the export market justifies the naming of this price. Indications are new blue overall cuttings can be bought at 5 cents a pound at shipping points, blue cheviots at 5.25 cents, bleached canton flannels at 6.50 cents, black silesias at 3.75 cents, fancy shirt cuttings at 2.50 cents, light silesias at 4.75 cents, khaki cuttings at 4.50 cents and washables at 2.25 cents. It is possible that buyers can shade these prices in some instances.

Roofing rags have eased further in value. In the East, No. 2 domestic classification roofing stock is quoted at 75 to 80 cents per hundred pounds f.o.b. shipping points; on the other hand, No. 1 roofing is held at relatively higher prices or up around 1.20 cents a pound at shipping points. Old whites and blues are selling so sparsely that it is a difficult matter to determine what their price levels are.

◆ Rope and Bagging

Paper mills evince very little interest in old rope or scrap bagging, and other than for a small-lot sale now and then, the market is bare of activity. The nominal price basis on old manila rope is 3 cents a pound for No. 1 domestic f.o.b. dealers' shipping points, and 2.75 cents for foreign old rope ex dock New York. Dealers and importers assert the market is shy on supplies and therefore they are not compelled to press for sales. No. 1 domestic scrap bagging is about 1.50 cents a pound at shipping points; it is probable purchases could be engineered at less, but dealers are not pressing offerings. Some sales of gunny bagging are reported but to consumers other than paper mills.

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Import and Export MARKETS

IMPORTS

◆ Wood Pulp

The market for imported wood pulp is simply flat. There is scarcely a market existing. Pulp is moving in from abroad, to be sure, against contracts or old orders, and arrivals are commencing to increase after the winter lull as first open water shipments from Scandinavia begin to reach United States ports, but the market is well nigh bare of current activity. Papermakers are not purchasing pulp, other than in very exceptional instances; they do not even so much as display interest in their principal raw material while still having—in a large majority of cases—more pulp in their storehouses, on the docks or on contract than they relish owning under prevailing market circumstances. Demand is at a bare minimum, and pulp importers, agents and producers, having reached that stage long since where they became discouraged in their efforts to effect sales, are pursuing a waiting policy, doing very little in an attempt to stir up business.

Indications are that stocks are being gradually, though much too slowly to suit those on the selling side of the trade, diminished as consumers eat into their inventories and absolutely refuse to buy. Meanwhile the market is at a virtual standstill. Occasional transactions are of course recorded, perhaps most often involving resale lots of pulp, but they are so few and far between that it can accurately be stated that a pulp market is at present non-existant. Prices are at best nominal. There is a wide spread between the quotations named by producers in Europe as figures they would accept on pulp for forward shipment from abroad and the prices at which it is known resale pulp has been sold on the spot in this country. European manufacturers are of course maintaining their prices while having in mind the sizable tonnages they have under contract for the American market during 1938, and knowing that if they cut down prices on new orders they probably would have to readjust prices of old commitments on a substantially lower level.

Producers abroad quote 3.75 to 4.25 cents, if not higher, for prime bleached sulphite for shipment over the next few months. Resale lots of such pulp have been reported sold in our spot market at 3 to 3.25 cents, and probably at less. Prime strong unbleached sulphite is around 2.75 cents a pound for shipment from abroad, and available from resellers at 2.25 cents or less. Kraft is quoted from abroad at 2.50 cents per pound and higher, and it is said resales have been made here at 2 cents and perhaps at slightly lower prices. Consumers are not pressing pulp for resale; as a matter of fact, it is said, the aggregate volume of pulp resold has been small at best, but it is evident the pulp is to be had at the resale price levels if there were buyers wanting it.

Imports of pulp into the United States fell to a still lower level during January following an appreciable decrease in the preceding month as compared with other months last year, the January receipts amounting to 131,609 short tons of chemical grades, valued at $5,965,308, according to U S. Department of Commerce reports. Imports in December last totaled 161,576 tons of a value of $7,008,359, and in January, 1937, 172,137 tons valued at $6,666,601.

◆ Paper Stock

Imports of paper base stocks other than wood pulp into the United States in January fell to a low level. Papermaking rag receipts amounted to 5,105,419 pounds of a declared value of $113,228, according to U. S. Commerce Department figures, representing a drop of 77 per cent in quantity compared with the similar month last year. Arrivals of miscellaneous paper stock, comprising old rope, scrap bagging, waste paper, etc., amounted to 4,960,494 pounds in January, valued at $82,233, a decline equivalent to 52 per cent contrasted with January, 1937.

◆ Paper

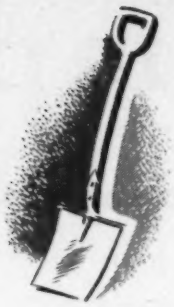
Imports of paper and paper products into the United States declined 13 per cent in January contrasted with a year ago, due largely to a decrease in newsprint receipts, which represent nearly 90 per cent of our paper imports. Receipts of newsprint in the first month of the current year amounted to only 184,761 tons, against 238,426 tons in the same month of 1937, a decline of 22½ per cent. Owing to the higher price in effect this year, the value of these imports dropped off only 13½ per cent. A decrease in the January receipts also was noted in a number of other items, including kraft wrapping, greaseproof and waterproof papers, writing paper, and miscellaneous boards. The aggregate value of paper imports in January was $8,414,573, of which $7,491,465 represented newsprint and $923,108 all other papers and paper products. Imports during January, 1937, were valued at $9,660,260, of which $8,655,720 represented newsprint and $1,004,540 other papers.

EXPORTS

Exports of paper and paper base stocks from the United States in January last reached a total value of $3,168,696, an increase of $575,698, or 22 per cent, over the value for the corresponding month in 1937, according to U. S. Department of Commerce figures. The larger part of this gain was due to increased shipments of paper base stocks, which accounted for 31 per cent of the total exports in this group, as compared with 26 per cent in January, 1937.

Exports of paper and paper products, amounting in total value to $2,185,450, surpassed the January, 1937, exports in value by $262,455, of 13½ per cent. Most items contributed to this increase and a comparison of the various items against last year's shipments indicates that the increase in volume was greater than indicated by the rise in value. In the printing group, exports of newsprint and cover papers were greater by more than 100 per cent; book papers dropped off 48 per cent, but surface-coated papers increased 30 per cent. Exports of wrapping papers were 19 per cent larger this year, the heaviest gains occurring in exports of kraft wrapping, which doubled in volume. Exports of greaseproof and waterproof papers and of miscellaneous wrappings, which make up about 5 per cent of the wrapping paper shipments, were only 12 per cent above the January, 1937, level. In the fine paper field, exports of tissue and crepe papers more than doubled, and writing papers increased nearly 35 per cent. Converted products, however, did not fare so well, toilet paper shipments dropping off 61 per cent, paper towels 2 per cent, and envelopes 18 per cent. Exports of paperboards, except building boards, accounted for some of the heaviest increases occuring in the group. Boxboard shipments rose by 85 per cent and other paperboards by 148 per cent.

Exports of paper base stocks continued to gain in importance in January. This was due largely to the increase in shipments of sulphite pulp, which accounts for nearly 70 per cent of the total. Exports of bleached sulphite of 7,161 tons were 11 per cent higher than a year ago, and shipments of unbleached sulphite rose to 2,213 tons from 1,052 tons in the same 1937 month. Other pulp exports were 967 tons of soda pulp and 976 tons of miscellaneous pulp. The aggregate value of paper base stocks shipped out of the United States in January was $983,246, of which $861,587 represented wood pulp exports. During the same 1937 month, exports reached a total value of $670,003, of which $521,413 represented wood pulp.



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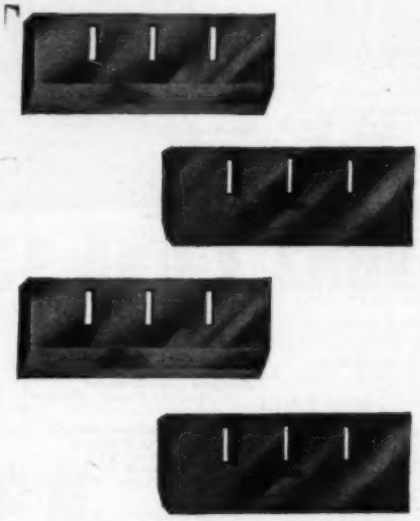

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Cambridge Instrument Co.
Taylor Instrument Cos.

Indicators (Super Heat)
Mason-Neilan Regulator Co.
Taylor Instrument Cos.

Interfolding Machines
Hudson-Sharp Machine Co.

Iron & Steel Supplies
American Rolling Mill Co.
J. T. Ryerson & Son, Inc.

Joints (Dryer)
Beloit Iron Works
Carthage Machine Co.
The Johnson Corporation

Jordan Engines
Emerson Mfg. Co.
E. D. Jones & Sons Co.
Shartle Bros. Machine Co.
Smith & Winchester Co.

Knives (Machine)
John W. Bolton & Sons
Simonds Worden White Co.

Knot Saws
D. J. Murray Mfg. Co.

Knotters
Improved Paper Mach'y Corp.
Moore & White Co.
Trimbey Machine Works

Latex
United States Rubber Products, Inc.

Layboys
Moore & White Co.

Lead Alloy Pipe
National Lead Co.

Lead Alloy Sheets
National Lead Co.

Lubricants
The Pure Oil Co.
Shell Petro. Corp.
Standard Oil Co. (Ind.)
The Texas Company

Lubricating Systems
S. F. Bowser & Co., Inc.
The Lunkenheimer Co.

Lubricators
S. F. Bowser & Co., Inc.
The Lunkenheimer Co.

Machine Shop Equipment
J. T. Ryerson & Son, Inc.

Materials Handling Systems
Link-Belt Company
Robins Conveying Belt Co.

Mechanical Packing
Garlock Packing Co.

Meters
Cochrane Corporation
Mason-Neilan Regulator Co.
Taylor Instrument Cos.
Worthington Pump & Mach'y Corp.

Meters (Flow)
Bailey Meter Co.
The Brown Instrument Co.
Cochrane Corporation

Meters (Liquid Level)
Cochrane Corporation
Mason-Neilan Regulator Co.

Mill Cogs
N. P. Bowsher Co.

Mixers
Patterson Foundry & Machine Company

Motor Drives
Patterson Foundry & Machine Company

Motor Generator Sets
Allis-Chalmers Mfg. Co.
Chicago Electric Co.
Moorhead-Reitmeyer Co., Inc.
Westinghouse Electric & Mfg. Co.

Motors
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Motors (Rebuilt)
Chicago Electric Co.
Moorhead-Reitmeyer Co., Inc.

Napkin Folders
Hudson-Sharp Machine Co.
Paper Conv. Mach. Co.

Oil
The Pure Oil Co.
Shell Petro. Corp.
Standard Oil Co. (Ind.)
The Texas Company

Oil Cups
The Lunkenheimer Co.

Oil Storage Systems
S. F. Bowser & Co., Inc.

Packing (Mechanical)
Garlock Packing Co.
United States Rubber Products, Inc.

Paper Bag Machinery
Smith & Winchester Co.

Paper Calender Rolls
B. F. Perkins & Son, Inc.
Textile Finishing Machinery Co.

Paper Cutters & Slitters
Beloit Iron Works
Cameron Machine Co.
Downingtown Mfg. Co.
Samuel M. Langston Co.
Moore & White Co.
Smith & Winchester Co.

Paper Dampeners
B. F. Perkins & Son, Inc.

Paper Machine Drives
Beloit Iron Works
Bird Machine Co.
Dodge Mfg. Corp.
Downingtown Mfg. Co.
General Electric Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Smith & Winchester Co.
Westinghouse Electric & Mfg. Co.

Paper Machines
Bagley & Sewall Co.
Beloit Iron Works
Black-Clawson Co.
Downingtown Mfg. Co.
Pusey & Jones Corp.
Smith & Winchester Co.

Paper Manufacturers
Kalamazoo Vegetable Parchment Co.

Paper Roll Trucks
Central Machine Works

Paper Testing Instruments
Arthur B. Green
B. F. Perkins & Son, Inc.

Pebble Mills
Patterson Foundry & Machine Company

Penstocks
Chicago Bridge & Iron Co.
Rodney Hunt Mach. Co.

Perforated Metal
Harrington & King Perforating Co.

pH Control (Automatic)
Wilkens-Anderson Co.

Pillow Blocks
Beloit Iron Works
Dodge Mfg. Corp.
Link-Belt Company

Pipe
Duriron Co.
Pittsburgh Piping & Equipment Company
J. T. Ryerson & Son, Inc.

Pipe Fittings
Cooper Alloy Foundry Co.
Taylor Forge & Pipe Wks.

Pipe (Glass)
Corning Glass Works

Pipe (Lead Alloy)
National Lead Co.

Pipe (Riveted or Welded)
Chicago Bridge & Iron Co.

Pipe (Spiral Lock-Seam)
Naylor Pipe Co.

Pipe (Spiral Riveted)
Taylor Forge & Pipe Wks.

Pipe (Spiral Welded)
American Rolling Mill Co.
Naylor Pipe Co.
Taylor Forge & Pipe Wks.

Pipe Systems Installed
The Grinnell Co., Inc.
Pittsburgh Piping & Equipment Company

Pipe & Tubes (Stainless)
J. T. Ryerson & Son, Inc.

Platers
B. F. Perkins & Son, Inc.

Plates (Iron & Steel)
American Rolling Mill Co.
J. T. Ryerson & Son, Inc.

Platework (Steel)
Chicago Bridge & Iron Co.

Plating (Chromium)
Chromium Corp. of Amer.

Power Transmission
Allis-Chalmers Mfg. Co.
Dodge Mfg. Corp.
Link-Belt Company
The Medart Co.
J. E. Rhoads & Sons

Press Rolls (Granite)
Beloit Iron Works
Downingtown Mfg. Co.
B. F. Perkins & Son, Inc.

Pressure Joints (Rotary)
Beloit Iron Works
The Johnson Corporation

Protective Coatings
Quigley Company, Inc.

Pulleys
Carthage Machine Co.
Dodge Mfg. Co.
Improved Paper Mach'y Corp.
E. D. Jones & Sons Co.
Link-Belt Company
The Medart Co.
D. J. Murray Mfg. Co.
Rockwood Mfg. Co.

Pulp (Chemical)
Weyerhaeuser Timber Co.

Pulpers
Bauer Bros. Co.

Pulp Process (Chem.)
Chemipulp Process, Inc.

Pulp Screens
Bird Machine Co.
D. J. Murray Mfg. Co.

Pulp Stones
Norton Co.

Pulp Thickeners
Bird Machine Co.
Carthage Machine Co.
Downingtown Mfg. Co.
Improved Paper Mach'y Corp.
Moore & White Co.
D. J. Murray Mfg. Co.
Oliver United Filters Inc.

Pulpwood Stackers
Link-Belt Company

Pumping Machinery
Lawrence Machine & Pump Co.

Pumps (Acid)
Duriron Co., Inc.
Oliver United Filters Inc.
Roots-Connersville Blower Corp.

GARLOCK 450 CHEVRON
for hydraulic service.
GARLOCK 451 CHEVRON
for oils at low temperatures.
GARLOCK 550 CHEVRON
for steam, air or gas.
GARLOCK 551 CHEVRON
for hot oils.

AUTOMATIC!

CHEVRON PACKING is so constructed that it adjusts itself automatically to compensate for variations in pressure. The exclusive hinge-like, cross-sectional shape expands as the pressure increases and contracts as the pressure decreases. Friction on the rod and on the packing itself is thereby reduced to a minimum. The performance of GARLOCK Chevron is remarkably efficient and economical on all types of equipment and in many industries. It will cut your packing costs.

THE GARLOCK PACKING CO.
Palmyra, New York

In Canada: The Garlock Packing Company of Canada, Limited, Montreal, Que.

Garlock CHEVRON

Bundling and Packaging Presses

Packaging and bundling presses for any purpose may be found in the Hudson-Sharp line of standard equipment for the paper converter. Unit illustrated is our No. 3 Heavy Double Pneumatic Press now in operation in numerous converting plants throughout the country.

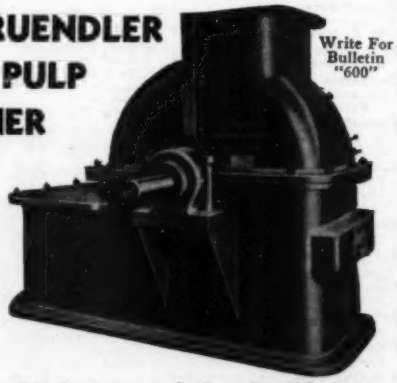
Folder showing complete line of Packaging and Bundling Presses mailed on application.

Hudson-Sharp Machine Co.
Green Bay, Wisconsin

A proven principal with a wide range adaption

NEW GRUENDLER TURBO PULP REFINER

Write For Bulletin "600"



Proven that it reduces power requirements in instances as high as

50%

Separates, Hydrates, and Combs Fibres

Producing a Better Refined Pulp at *Less Cost*

The remarkable GRUENDLER REFINER not only does the work with less power than other refiners, but it actually separates, hydrates and combs the fibres without disintegration and shortening of fibre usually caused by grinding. Laboratory tests prove that the pulp refined produces stronger paper than that refined by conventional refiners.

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Roots-Connersville Blower Corp.
Worthington Pump & Mach'y Corp.

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Allis-Chalmers Mfg. Co.
Buffalo Pumps, Inc.
Carthage Machine Co.
DeLaval Steam Turb. Co.
Downingtown Mfg. Co.
Duriron Co.
Economy Pumps, Inc.
Frederick Iron & Steel Co.
Goulds Pumps, Inc.
Ingersoll-Rand Company
Lawrence Machine & Pump Co.
Morris Machine Works
Nash Engineering Co.
Oliver United Filters Inc.
Smith & Winchester Co.
Warren Steam Pump Co.
Worthington Pump & Mach'y Corp.

Pumps (Deep Well)
Layne & Bowler, Inc.
Worthington Pump & Mach'y Corp.

Pumps (Rotary)
Roots-Connersville Blower Corp.

Pumps (Stock)
Allis-Chalmers Mfg. Co.
Beloit Iron Works
Buffalo Pumps, Inc.
Carthage Machine Co.
Downingtown Mfg. Co.
Economy Pumps, Inc.
Frederick Iron & Steel Co.
Goulds Pumps, Inc.
Moore & White Co.
Morris Machine Works
Shartle Bros. Machine Co.
Smith & Winchester Co.
Warren Steam Pump Co.
Worthington Pump & Mach'y Corp.

Pumps (Turbine)
Roots-Connersville Blower Corp.

Pumps (Vacuum)
Foster Wheeler Corp.
Nash Engineering Co.
Oliver United Filters Inc.
Roots-Connersville Blower Corp.
Worthington Pump & Mach'y Corp.

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The Brown Instrument Co.
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Chicago Electric Co.
Moorhead-Reitmeyer Co., Inc.

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Taylor Instrument Cos.

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J. O. Ross Eng. Corp.

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Downingtown Mfg. Co.

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D. J. Murray Mfg. Co.
Wiener Refiner Eng. Co.

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Cochrane Corporation
Mason-Neilan Regulator Co.
Taylor Instrument Cos.

Regulators (Steam)
Mason-Neilan Regulator Co.

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Flexrock Company

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B. F. Perkins & Son, Inc.
Textile Finishing Machinery Co.

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Textile Finishing Machinery Co.

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Rodney Hunt Mach. Co.
United States Rubber Products, Inc.

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American Rolling Mill Co.
J. T. Ryerson & Son, Inc.

Rosin Size
Hercules Powder Co., PMC

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D. J. Murray Mfg. Co.

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Beloit Iron Works
The Johnson Corporation

Rotary Printing Units
Paper Conv. Mach. Co.

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Oakite Products, Inc.
Quigley Company, Inc.

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General Chemical Co.
Pennsylvania Salt Mfg. Co.

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Carthage Machine Co.
Downingtown Mfg. Co.
Improved Paper Mach'y Corp.
Moore & White Co.
Oliver United Filters Inc.

Saws
Simonds Worden White Co.

Screen Diaphragms
United States Rubber Products, Inc.

Screen Plates
Bird Machine Co.

Screens (Centrifugal)
Improved Paper Mach'y Corp.

Screens (Chip)
Carthage Machine Co.
Link-Belt Co.
D. J. Murray Mfg. Co.

Screens (Diaphragm)
D. J. Murray Mfg. Co.

Screens (Flat)
Beloit Iron Works
Downingtown Mfg. Co.
Improved Paper Mach'y Corp.
D. J. Murray Mfg. Co.
Robins Conveying Belt Co.

Screens (Rotary)
Bird Machine Co.
E. D. Jones & Sons Co.
Moore & White Co.
Trimbey Machine Works

Second Hand Machy.
Shartle Bros. Machine Co.

Separators (Chip)
Carthage Machine Co.

Shafting
Allis-Chalmers Mfg. Co.
E. D. Jones & Sons Co.
Link-Belt Company
The Medart Co.
Midwest-Fulton Mach. Co.
J. T. Ryerson & Son, Inc.

Shafts (Collapsible)
Cameron Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.

Sheets (Lead Alloy)
National Lead Co.

Sheets (Lead)
National Lead Co.

Sheet Metal Work
J. O. Ross Eng. Corp.

Sheets (Iron & Steel)
American Rolling Mill Co.
J. T. Ryerson & Son, Inc.

Sheets (Stainless Steel)
J. T. Ryerson & Son, Inc.

Short Center Drives
Rockwood Mfg. Co.

Shower Pipes
Beloit Iron Works
Bird Machine Co.
Downingtown Mfg. Co.
Emerson Mfg. Co.
Moore & White Co.
Smith & Winchester Co.

Shredders
Carthage Machine Co.
E. D. Jones & Sons Co.

Sifters
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Silent Chain Drives
Link-Belt Company

Silicate of Soda
General Chemical Co.
Pennsylvania Salt Mfg. Co.

Sizing
National Oil Products Co.

Slashers
D. J. Murray Mfg. Co.

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Beloit Iron Works
Cameron Machine Co.
Downingtown Mfg. Co.
Samuel M. Langston Co.
Moore & White Co.
Smith & Winchester Co.

Sluice Gates
D. J. Murray Mfg. Co.

Soda Ash
Columbia Alkali Corp.
Hercules Powder Co., PMC
Mathieson Alkali Works
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.

Sodium Aluminate
Pennsylvania Salt Mfg. Co.

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Downingtown Mfg. Co.
Hudson-Sharp Machine Co.
Rodney Hunt Mach. Co.
Improved Paper Mach'y Corp.
E. D. Jones & Sons Co.

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Rodney Hunt Mach. Co.
Lewellen Mfg. Co.
Link-Belt Co.

Speed Reduction Units
DeLaval Steam Turb. Co.
Foote Bros. Gear & Machine Corp.
Rodney Hunt Mach. Co.
Link-Belt Company
Midwest-Fulton Mach. Co.
Poole Foundry & Machine Co.

Splitters (Wood)
Carthage Machine Co.
D. J. Murray Mfg. Co.

Sprockets
Improved Paper Mach'y Corp.
Link-Belt Company

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J. T. Ryerson & Son, Inc.

Steam Joints
Beloit Iron Works
The Johnson Corporation
Shartle Bros. Machine Co.

Steam Purifiers
Cochrane Corporation

Steam Traps
Cochrane Corporation
Midwest-Fulton Mach. Co.
Stickle Steam Spec. Co.

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Joseph T. Ryerson & Son

Steel Platework
Chicago Bridge & Iron Co.
Graver Tank & Mfg. Co.

Steel Strapping
The Stanley Works

Steel Tanks
Chicago Bridge & Iron Co.
Graver Tank & Mfg. Co.

Stock Cutters
B. F. Perkins & Son, Inc.

Stokers
American Engr. Co.
Link-Belt Company
Westinghouse Electric & Mfg. Co.

Strainers
Carthage Machine Co.
The Duriron Co., Inc.
Mason-Neilan Regulator Co.

Strapping Steel
The Stanley Works

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Improved Paper Mach'y Corp.
E. D. Jones & Sons Co.
Midwest-Fulton Mach. Co.
Moore & White Co.
D. J. Murray Mfg. Co.

Suction Boxes
Beloit Iron Works
Black-Clawson Co.
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
Pusey & Jones Corp.

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Beloit Iron Works
Downingtown Mfg. Co.

Suction Rolls
Beloit Iron Works
Downingtown Mfg. Co.

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Carthage Machine Co.
Chemical Constr. Corp.
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Supercalenders
B. F. Perkins & Son, Inc.
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Tachometers & Tachographs
Bailey Meter Co.
The Brown Instrument Co.

Tanks and Vats (Wood)
Rodney Hunt Mach. Co.
Kalamazoo Tank & Silo Co.
New England Tank & Tower Co.

Tanks (Glazed Tile)
Kalamazoo Tank & Silo Co.

Tanks (Oil)
The Lunkenheimer Co.

Tanks (Steel)
Chicago Bridge & Iron Co.
Graver Tank & Mfg. Co.

Tensile Strength & Stretch Testers
B. F. Perkins & Son, Inc.

Testers (Bursting Strength)
B. F. Perkins & Son, Inc.

Testers (Freeness)
Arthur B. Green

Testers (Opacity)
Westinghouse Electric & Mfg. Co.

Thermometers
The Brown Instrument Co.
Mason-Neilan Regulator Co.
Taylor Instrument Cos.

Thickness Control
Lewellen Mfg. Co.

Thrashers (Rag)
Pusey & Jones Corp.

Toilet Folding Machines
Hudson-Sharp Machine Co.

Toilet Winders
Hudson-Sharp Machine Co.

Transmission (Variable Speed)
Lewellen Mfg. Co.
Link-Belt Company
Moore & White Co.

Tray Elevators
Gifford-Wood Co.

Trippers
Robins Conveying Belt Co.

Trucks (Paper Roll)
Central Machine Works

Tube Mills
Patterson Foundry & Machine Company

Tubes (Nickel Alloy)
International Nickel Co.

Turbines (Steam)
Allis-Chalmers Mfg. Co.
DeLaval Steam Turb. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Turbines (Water)
Rodney Hunt Mach. Co.

Turpentine
Hercules Powder Co., PMC

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The Lunkenheimer Co.

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D. J. Murray Mfg. Co.
J. O. Ross Engr. Corp.

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United States Rubber Products, Inc.

Valve Specialties
Duriron Co.
Eastwood-Nealley Corp.
The Lunkenheimer Co.
Mason-Neilan Regulator Co.
Wm. Powell Co.

Valves
Carthage Machine Co.
Cochrane Corporation
Cooper Alloy Foundry Co.
Duriron Co.
Eastwood-Nealley Corp.
International Nickel Co.
The Lunkenheimer Co.
Mason-Neilan Regulator Co.
D. J. Murray Mfg. Co.
Wm. Powell Co.

Valves (Electric & Air Operated)
The Brown Instrument Co.
The Lunkenheimer Co.
Mason-Neilan Regulator Co.

Valves (Gates)
The Lunkenheimer Co.
Wm. Powell Co.

Valves (Multiport)
Cochrane Corporation

Valves (Non-return; Emergency Stop)
The Lunkenheimer Co.
Wm. Powell Co.

Valves (Paper Stock)
Eastwood-Nealley Corp.
E. D. Jones & Sons Co.
Mason-Neilan Regulator Co.

Valves (Relief)
The Lunkenheimer Co.
Mason-Neilan Regulator Co.
Wm. Powell Co.

Valves (Vacuum Regulating)
Mason-Neilan Regulator Co.

Vapor Absorption Systems
J. O. Ross Eng. Corp.

Ventilating Fans
B. F. Perkins & Son, Inc.

Ventilating Systems
J. O. Ross Eng. Corp.

Washers
Downingtown Mfg. Co.
Improved Paper Machinery Corp.
Moore & White Co.
Oliver United Filters Inc.

Washers (Wood)
Carthage Machine Co.
Downingtown Mfg. Co.

Water Backs
Foster Wheeler Corp.

Waterproof Compounds
Flexrock Company
Quigley Company, Inc.

Water Softeners
Cochrane Corporation
Graver Tank & Mfg. Co.

Water Wheels
DeLaval Steam Turb. Co.

Wax Emulsions
Franklin Research Co.

Wax Size
Franklin Research Co.
National Oil Products Co.

Weigh Larries
Robins Conveying Belt Co.

Well Systems
Layne & Bowler, Inc.

Wet Machines
Carthage Machine Co.
Downingtown Mfg. Co.
Improved Paper Machinery Corp.
Smith & Winchester Co.

Whistles
The Lunkenheimer Co.

White Lead
National Lead Co.

Winders
Bagley & Sewall Co.
Beloit Iron Works
Black-Clawson Co.
Cameron Machine Co.
Downingtown Mfg. Co.
Samuel M. Langston Co.
Moore & White Co.
Smith & Winchester Co.

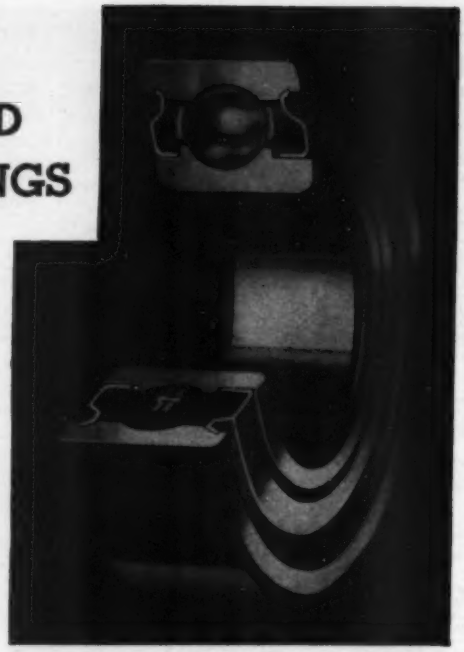
Wire Cloth (Nickel Alloy)
International Nickel Co.

Wires (Paper Machine)
Appleton Wire Works
Eastwood-Nealley Corp.
Lindsay Wire Weaving Co.

Wood Grapples
Link-Belt Company

Worm Drives
DeLaval Steam Turb. Co.

SELF-SEALED BEARINGS



"9000-DD", with Double Metal Seals, here shown; also made as "9000-D" with Single Metal Shield.

"NORMA-HOFFMANN"
PRECISION BEARINGS
BALL, ROLLER AND THRUST

LARGER GREASE CAPACITY NO SEAL DRAG

IN "9000" SERIES (Feltless)

Interchangeable in dimensions with felt seal bearings.

Employs simplified, inwardly extending, flanged metal shields which do not rotate and cannot "foul" other rotating seal parts.

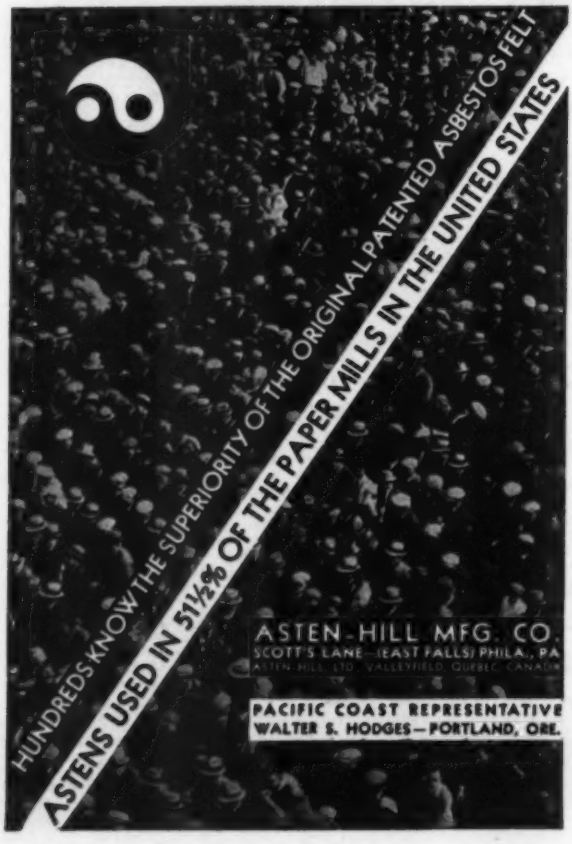
Seals are highly efficient in retaining grease in either horizontal or vertical position.

Simple seal occupies less space within bearing than felt seal, PROVIDING GREATER GREASE CAPACITY AND A MORE LASTING LUBRICANT SUPPLY.

Metal seals, though close fitting, clear recess on inner ring, ELIMINATING "DRAG" OR FRICTIONAL RESISTANCE and power loss, and providing higher starting speeds and increased efficiency. Seals cannot wear and are permanently effective.

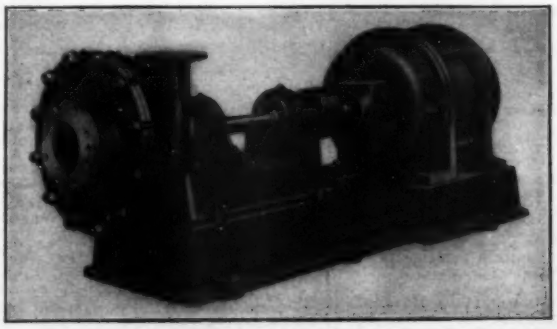
Totally sealed against foreign matter, providing absolute cleanliness at all times.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U.S.A.


HUNDREDS KNOW THE SUPERIORITY OF THE ORIGINAL PATENTED ASBESTOS FELT
ASTENS USED IN 51½% OF THE PAPER MILLS IN THE UNITED STATES
ASTEN-HILL MFG. CO.
SCOTT'S LANE (EAST FALLS) PHILA., PA
PACIFIC COAST REPRESENTATIVE
WALTER S. HODGES—PORTLAND, ORE.

WHAT'S YOUR PUMPING COST?

It's the cost per gallon pumped—not the cost of the pump itself—which counts in the long run. With a LAWRENCE CENTRIFUGAL built for your special conditions, you'll secure the lowest pumping costs. And you will pay no more for a LAWRENCE CENTRIFUGAL than for another pump less carefully engineered to give you the service you seek. Let us discuss pumping costs with you.



LAWRENCE MACHINE and PUMP CORP'N
367 Market Street LAWRENCE, MASS.

LAWRENCE CENTRIFUGAL PUMPS

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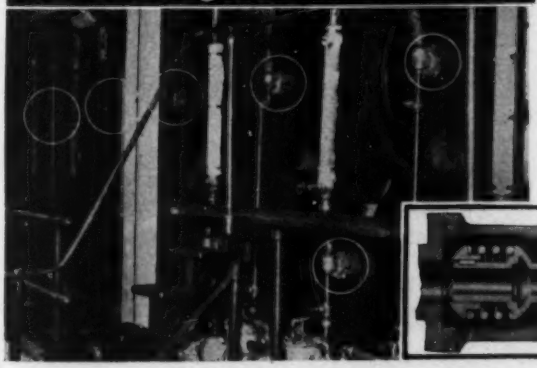
These are good stairs — but — THEY WON'T BE NEEDED NOW!



• At least no one will need to climb them for inspecting, packing, oiling and adjusting the stuffing boxes; for this is one of the many paper machines where Johnson Rotary Pressure Joints have ended stuffing box troubles. The sectional view shows the basic construction of these Johnson Joints. Two special, self-lubricating carbon graphite rings form the bearings and pressure seal. Sealed by the pressure, they are self-adjusting. Equally important is the ball and socket design and the annular space around the outlet which provides for angular or lateral misalignment —greatly increasing joint life.

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Applies to flow boxes, closed slush lines, beaters of all types. (Arrangement shown is for flow box)

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Used in a slush line, it indicates, records, regulates stock density.

Used before and after refiners, indicates, records exact work done on stock by refining, which embraces more than freeness.

Used on beaters, indicates, records exact density of furnish, exact blending of pulps, exact additions of size, loading, alum. Indicates, records exact work done on stock by the beater, which embraces more than there is space for here.

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